FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

UNIVERSITY OF MALAYA

COMPANY INFORMATION PORTAL

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WXES 3182

Session 2002/2003

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A system development in partial fulfillment of the requirements of the degree of Bachelor of Information Technology University of Malaya

ABSTRACT

Company Information Portal is a Web-based portal that provides related company information to users who visited the Web site. It is developed to allow user readily and easily access a portal for information. With the Company Information Portal, user of Tenaga Nasional Berhad Generation (TNBG), Prai will be able to gather information of the company in the shortest period. The Company Information Portal is a combination of a few modules, namely company profile, projects for TNBG, TNBG site plan, statistical information and site map. The Prototyping model is chosen as the development methodology.

Company Information Portal is accomplished using techniques suitable and compatible with a Windows 2000 operating system. ASP was used as the same main platform for development as together they made it possible to build a standard recognizable icons and user-friendly environment graphical user interface GUI).

The user who has the administrator access right can be able to edit some of the information such as mission, vision, history and projects that can be changed from time to time. With this features, the user could easily update the latest changes without involving the coding.

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Chapter 1

INTRODUCTION

1.1 Project Overview

Currently, there is a paradigm shift from the traditional thinking about an information system to an Internet portal. A company portal provides access to information, applications and systems from literally anywhere through a Web browser. The Internet portal in use nowadays has made it possible to gather information about a company much easier than ever. Users need not go to the company just to get a small piece of information such as rate of charges or history of the company. The existence of the Internet portal provides all the information needed displayed through the company's Web site.

The term *company information portal* is a gateway to access with information about a company, which can either be found at a single Web site or located at other Web sites (Hurley, 2001). There are mainly two different types of Internet portals, which are the general portals, and the dedicated portals. The general portals are common interest portals that cover a wide range of topics and features (Windows, 2000). Examples of these general portals are Yahoo! and Lycos. The dedicated portals are narrower in coverage, which is excellent in assisting users in finding specific subjects.

A good company portal is not easy to develop because it is very extensive and inclusive. It is a daunting challenge that involves a broad diversity of concern such as technological, social and policy issues. To build a successful portal, the object-oriented approaches can be applied. These distinct objects then will be integrated to become a full-fledged company portal. All these features can help develop a more efficient portal that ensures effectiveness and frequent visits to the Web site by users.

1.2 Motivation

The World Wide Web has been growing and changing at an exponential rate. It has been reported that there are 100 million users in the world in 1997 and this will increase to one billion by the year 2005 (Superjaring, 1999). This numerical statistics has provided the motivation to develop the company information portal to ensure that the Internet users could gain necessary information they need as long as they have the basic equipment such as a personal computer with Internet access. In addition, it is convenient for users as they can access the portal's content at their own computer without needing to travel to the company just to get the information they need. This project will be developed by a team of two members, with each member concentrating on specific modules of the proposed portal.

The overwhelming amounts of information encompassing Internet portals require an excellent system to render information accessible and useful. Therefore the development for this system is mainly to provide the user with some useful information about a company.

1.3 Significance of this Project Why is Company Portals Important?

Company Information Portal that is going to develop is important because:

a) Company portals provide useful information to the user in TNBG, Prai such as company profile, activities that is going on currently and other related information.

b) Company portals also ease the work of finding information by the users.

c) Company portals will offer update-to-date information and attractive Web site.

1.4 Goals and Objectives

This project is made up of two project members and each one of us will be focusing on the different aspect in the effort to develop a company information portal for the Tenaga Nasional Berhad Generation (TNBG) Sendirian Berhad, Prai.

1.4.1 Project Goals

This project aims to develop a Company Information Portal that offers a single, authoritative, up-to-date company information resources and at the same time providing readable quality contents to anyone visiting the site. This is to provide an accessible portal for all the Internet users.

The developer will focus on the back-end system providing one of the portal-enabled knowledge tools. The main aim is to develop a textual and multimedia system, which makes it easy to attach for information searching about a company.

1.4.2 Project Objectives

The main purpose of the project is to offer useful information to anyone who is interested in searching for information about a company. This portal hopes to benefit everyone who is gaining information without need to get the details personally from the office. Therefore, this portal would become a resource for all levels of user. This project hoped to realize the following objectives:

a) To develop a useful portal for users to access information about TNBG, Prai.

b) To develop a scalable platform that will not only contain just company information but also all the relevant information related to the company.

c) To ensure that users could get the information needed in the shortest period

d) To ensure access for all levels of users who are looking for information about the company.

e) To represent the company information in a more interesting, attractive and interactive manner.

f) To offer easy navigation and access for TNBG's arrangement personnel to information system embedded in the portal.

1.4.3 Individual Objectives

The individual objective of this study is to support the company information portal in the following aspect.

a) To develop an accurate, effective and efficient system that enables different information to be displayed clearly and readably.

b) To provide an automated full-text indexer for textual data.

c) To provide an easy-to-use application for indexing multimedia contents.

d) To integrate a system that presents the relevant information to assist the end user.

e) To develop a user-friendly to template-based portal, this could be easily updated and maintained by non-technical staff.

1.5 Project Scope

This project aspires to develop an Information Portal for the Tenaga Nasional Berhad Generation in Seberang Perai. Different types of company portal need to be survey to know the advantages and weaknesses of each portal to ensure a better company portal could be developed.

1.5.1 Project Modules

To provide a suite of comprehensive functions and extensive access to a company portal, the project team has identified a few interdependent modules. These modules are as follows:

- Mission and Vision
- History – Company Background
- Organization Chart
- Projects
- Environment Issues

- ISO Certification
- Electronic Discussion Board for Staff
- User's Feedback
- Company Map
- Social and Welfare Activities

1.6 Project Schedule

A project schedule must be carefully planned if the project is to be successful. Moreover, it is very crucial to estimate the time it takes to complete each task or activity. The whole purpose is to reduce the inherent uncertainty in projecting the timeline of the project.

Gantt chart (Figure 1.2) is used to depict the project's work breakdown. This helps the team members to track their progress at each step as well as it would ensure that the project follows the specified schedule. The project team has used a structured approach to plan the project schedule. The project development is divided into two main parts. The first part of the project development generally involves the modeling, analysis and design phases. This involves a detailed system study, comprehensive literature review, user requirement study, initial system design and a viva session.

The second part mainly focuses on the development, implementation and evaluation phases, which comprises the final part of the initial system design, the system

modules coding, system testing and evaluation, implementation and user training. Apart from that, the system documentation and the supervisor consultation sessions were carried out at all times during the whole period of the project development.

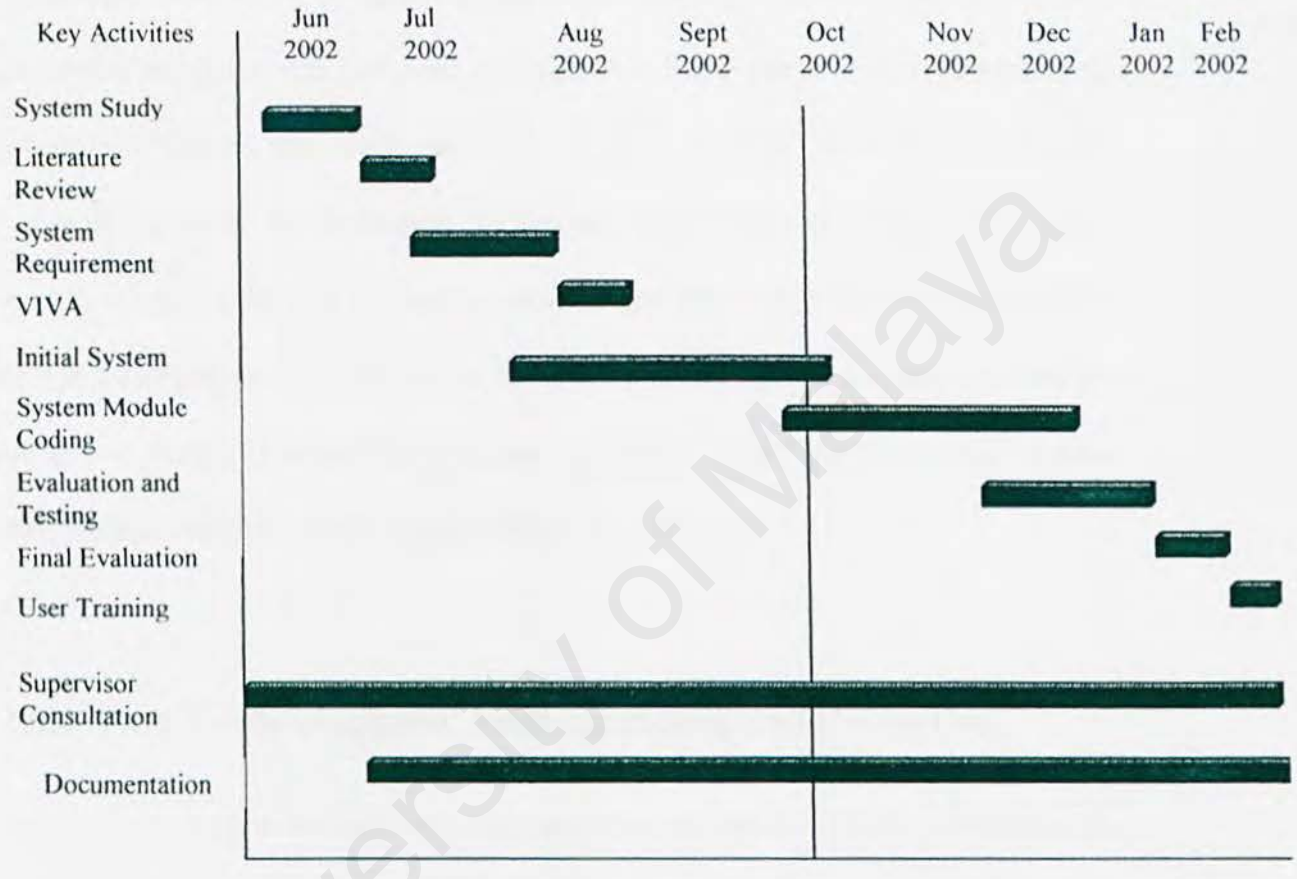

Figure 1.1: The Gantt Chart of the Company Information Portal

1.6.1 Part 1 – Modeling, Analysis and Design

The system study will take up the first three weeks of the project schedule. This detailed system study consists of defining the whole project's objectives, scopes, modules and scheduling. In this period of time, consultation with the project supervisor is frequent to clear up misconceptions and to solve some problems that arise. The comprehensive literature review should take up three weeks in order to

conduct thorough research of various resources such as articles from magazines, books, journals, libraries and authoritative Internet resources. The project teams expect to spend about five weeks to complete an exhaustive system requirement analysis. This is based on survey and interview session to be carried out in order to gather data from users. In addition, the system development tools analysis is also performed to specify the hardware and software requirement. The viva session is scheduled between the third week of August, whereby the propositions and comments given by the moderator will be considered to further enhance the system. A total of ten weeks will be used to propose and come up with the initial system design. Each project modules will be designed in accordance to the user requirement using E-R (Entity-Relationship) diagram and DFD (Data Flow Diagram). Besides that, the user interface of the system will also be designed

1.6.2 Part 2 – Development, Implementation and Evaluation

The complex system modules will take up to eleven weeks in order to develop the coding for the proposed modules. This is to ensure high quality coding, debugging and thorough testing as well as a reliable system. Eight weeks is then used for a complete evaluation and testing of the system as a whole. At this point, the critical system ensures the system functions effectively. The final implementation stage of the system is planned for three weeks to accomplish. A group of users will undertake this testing as well as to provide the evaluation of the final system. Ultimately, the last stage of the project development will provide the user training for one week. The purpose of doing so is to train the targeted users on how to use and implement the system.

Weekly consultation with project's supervisor, Assoc. Prof. Dr. Zainab Awang Ngah is scheduled throughout the whole period of system development. The project documentation is another essential task in any development work. The project documentation is important as it provides easy reference for other similar projects and can be used as guide for new developers for any future enhancement or modifications to the system.

1.7 Expected Outcome

The main target was to realize the important of the Information Portal to TNBG, Prai. By knowing more detail about the portal in the market, a better portal could be developed along this project. So the proposed Company Information Portal will make sure that the users able to search information using the fastest and easiest way.

1.8 Chapters Summary

This section provides a summary of the seven chapters involved in the development of the proposed system. The chapters are divided into two major parts. The first part is the Modeling, Analysis and Design, which comprises of four chapters. These four (4) chapters are Introduction, Literature Review, Methodology and System Analysis, and System Design. The second involves the Development, Implementation and Evaluation of the system. The system Implementation, System Testing and Evaluation and the Conclusion and Future Enhancement made up the last three (3) chapters that form the second part of the report.

1.8.1 Part 1 – Modeling, Analysis and Design

a) Chapter 1 – Introduction

This opening chapter introduces an overview of the project's proposal. This includes the project overview, project motivation, goals and objectives, project scope, plan and methods and also the schedule of the project. Overall, this chapter is the initial system study that covers the project fundamentals and determines the project feasibility.

b) Chapter 2 – Literature Review

This chapter covers a comprehensive literature review of other works on associated issues and fields of interest. This is divided into two main parts. Part 1 consists of the critical analysis and features study on available company portal, while part 2 comprises literature review on the similar existing system for the project which is going to develop.

c) Chapter 3 – System Analysis

This chapter clearly identifies and clarifies the methodology, mechanism and approach to be adapted. It is important to justify these development approaches to enlighten the reader of its significance. A detailed system development tools analysis is also included and this refers to the practicality, effectiveness and appropriateness of chosen tools in solving the problem presented.

d) Chapter 4 – System Design

The various modules and components of the proposed system are analyzed and justified in this chapter. This chapter covers the analysis and design fundamentals that include the data flow approach, architectural and database design, functional design and also the user interface design.

1.8.2 Part 2 – Development, Implementation and Evaluation

a) Chapter 5 – System implementation

The fifth chapter describes the system software development as specified in the designed blueprints. It is first developed in a developmental operated environment and later implemented in the actual environment using real-time data. This will eventually prepare the system for the initial system evaluation and debugging.

b) Chapter 6 – System Testing and Evaluation

The methodical approaches for debugging and testing of the system are explained in this chapter. The system test results are also outlined according to modules. In addition, the summary of the system evaluation that comprises evaluation by groups of users.

c) Chapter 7 – Conclusion and Future Enhancement

The last chapter will conclude this report by outlining the problems faced, approaches for solution, system strength and limitation of the final product as well

as highlight some of the anticipated outcomes. A proposal for future work to enhance the system is also clarified in this chapter.

Finally, an overall conclusion based on the project development proposal is provided at the end of the report.

Chapter 2

LITERATURE REVIEW

2.1 The Company Information Portal

Company information portal started out as a means to share invaluable company information such as policies, procedures, benefits, management of the company, activities, bulletin boards and links to company related societies within an organization as well as at departmental level. It can also include line of business information, such as customer – account material, internal research and development documents, business plans, financial data and competitive intelligence. The value proposition of company information portal is the ability to access information, applications and systems from literally anywhere through a Web browser (Hurley, 2001). It is a well – known fact that the Web is the most efficient medium for publishing and sharing company information.

Customers looking for information about products and services only have to go to company information portals and search engines to get the latest information from company websites before making a decision. Companies who are currently online have a business advantage since their information is available like print or video ad, 24 hours a day, seven days a week (Mahmud, 2001).

Often a company information portal was developed in house or purchased, based on the specific business needs of a department or work group. Now, Company Information Portal has become an infrastructure decision that is usually company wide. Accordingly companies must look at the portal's relationship to applications and servers. However, infrastructure considerations should not overshadow the underlying business objectives of the portal (Folger, 2001).

Definition:

Company

- An association of persons for the purpose of carrying on some enterprise or on some legitimate business (www.dictionary.com).

Information comprises

- Knowledge derived from study, experience or instruction.
- Knowledge of specific events of situations that has been gathered or received by communication; intelligence or news.
- A collection of facts or data which process store or transmit into data.

Portal

- A portal is a Web address destination to which people with some common set of characteristics, interests, or needs go to gather information, interact

with data, experience entertainment, exchange thoughts, or conduct transactions. Portal is a term like database or network, all of which provide a sense of what kind of technology is involved, but none of which say anything about what the portal, database, or network is used for, who uses it, or why they use it (Hurwitz, 2001).

- A portal can also be defined as a web site that aims to be an entry point to the World-Wide-Web, typically offering a search engine or links to useful pages, and possibly news or other services. These services are usually provided for free in the hope that the users will make the site their default home page or at least visit it often. Popular examples are Yahoo and MSN. Most portals on the Internet exist to generate advertising income for their owners; others may be focused on specific groups of users and may be part of an intranet or extranet. Some may just concentrate on one particular subject, for example technology or medicine, and are known as vertical portal (Howe, 2001).

Company portal:

- Company portal can include links to information sources, such as Internet news feeds, stock tickers, calendars, news announcements, human resources self-service applications or discussion groups. The portal can be tailored to present information based on the needs of a group of users or individual users (Gullette, 1999).

2.2 Types of Portal

There are two different types of portal and these are:

a) Static

Static portals are fixed and give the impression of a website whose content is always the same. If there are any changes or additional to the WebPages or deemed necessary, it would need to alter or created using HTML (hyper text mark-up language). A good example of static websites would be personal homepages that are almost never updated such as http://members.nbci.com/smfthq/, which is a Sailor Moon Fan site.

b) Dynamic

Dynamic websites are constantly changing websites. The WebPages of this Internet sites are created "on-the-fly", based on the latest data available. These websites use specialized server programs and database applications to continuously update themselves. Site administrators use dedicated back-end programs linked to the web database to enter new content. *CNN* and *Star* newspaper would be the prime examples of a dynamic website, as the news changes constantly on these sites.

2.3 Benefit Offered By Company Information Portal

Company information portal is a useful tool for aggregating business and providing links to public Web sites and syndicated data. While these capabilities have yielded considerable benefits, company information portal can also serve as an effective way

to integrate back office applications. By providing a framework for gluing together much interdependent business application, company information portal can play a key role in reducing complexity and increasing productivity.

A company information portal does not eliminate applications but to offers a single focal point for company resources. Users can have a truly personalized experience that allows broad searching of structured and unstructured information, a centralized point for linking to a collection of applications and a method for initiating processes that transcend multiple systems (Edelman, 2000).

2.4 Features That Most Portal Companies Include In Their Products

The Company Information Portal movement has gained so much momentum that it has become difficult to differentiate between products. Virtually every company claims to offer a portal. Below are the set of features that most company portal includes.

2.4.1 Business Intelligence

This allows reports to be generated from business databases. Tools often provide in-depth number crunching and support the extensive analysis of data. Reports can be manually executed or triggered through a variety of events.

2.4.2 Transaction Integration And Processing

Most company information portals have underlying component applications that serve as the driving force. These normally will provide access to structured databases as well as unstructured information in the form of documents. Certain people recognize that the company information portal consists not only of access, but the ability to have the component applications communicate and perform integrated processes. Consequently, processing transactions between applications can provide strategic value.

2.4.3 Cross-Repository Searching

Because many company information portals originated from knowledge-management systems, the ability to perform cross-repository searches has become a common feature. Users can go to one place and perform searches across disparate repositories such as a Lotus Notes database, Microsoft Exchange public folders, Web sites, file systems, databases and a collection of other repositories.

2.4.4 Taxonomy Creation

Many company information portals offer a knowledge-management component that lets information be automatically or manually categorized into clusters. This allow for an alternative searching metaphor.

2.4.5 Integration And Compliance With Global Directory Services

Company information portals are designed to be used by one or many companies and as such are often tied into global directory services such as Lightweight Directory Access Protocol or Windows NT Domain Services. This eliminates or minimizes the duplication of data for users and group information.

2.4.6 Link To Web Sites

Many company information portals provide users with the ability to include links to other Web sites. This may be a direct link, reduced function windows that provides some view into Web sites, or a combination of both.

2.4.7 Personalization

In the context of company information portals, personalization normally refers to the personal selection and placement of content or features available to the user. Personalization also refers to personalized color or theme preferences.

2.4.8 Single Sign-On

Having a centralized database function within the company information portal normally performs it. The database will contain the proper authentication credentials for each component application.

2.4.9 Subscriptions

This lets users subscribe to applications in the company information portal. When additions and deletions are performed for a particular database record, for example, users may elect to be notified via E – mail.

2.4.10 Syndication

This refers to the syndicated data available, normally freely, by content providers. Syndicated data can be virtually any information source and is similar to a news feed that delivers information to your company information portal.

2.4.11 Collaboration

This means open to interpretation. In the context of the portal, it could include any or all of the capabilities as workflow and routing of documents, discussion threads, user-chat sessions, dynamic group and team creation and interactive collaboration that including video, voice and application sharing.

2.4.12 Document Management

Some portal vendors incorporate some level of document management in their systems. This provides a way to manage documents and Web content throughout the project life cycle. It can also include versioning, security, metadata searching, and a host of other features (Edelman, 2000).

2.5 Purpose of Portals

Portals are specifically designed to cater for the needs of three major communities, namely knowledge management practitioners, researchers and solution providers. Besides that, portals also provide a platform for knowledge management professionals to exchange industry and academic information and share knowledge management resources. The purpose is to promote the study, practice and implementation of knowledge management (Whyte, 2001).

By using a portal, a customer can look for information about products and services and search the latest information from personal and corporate websites (Mahmud, 2001). Portals adds a layer of intelligence to personalization and customization that lets site designers and end users tailor pages to meet individuals' needs (Hurley, 2001).

Portals can provide an invaluable information resource to the employees of a company. It can be powerful tools for delivering information to the employees and customers. For example, the Hewlett-Parkard Co., the initial thought for its HR portal was to automate many of the functions that go into helping employees with their request for time off, questions about health insurance, explaining policies and procedures (Ambrosio, 2001).

2.6 Portal Uses and Capabilities

Usually an organization deploys portal servers to build these centralized interfaces that let users find the content they need through browsers. There are few benefits that include knowledge sharing, reduction in redundancy of work and time-sharing. There are a few different motivations for deploying portal servers. The different motivations are shown below:

a) Many are interested in using portals as the main interface for corporate Intranets, to give employees access to the information they need to do their jobs. This can include general company information, such as policies, procedures, benefits and company news. It can also include line-of-business information, such as customer-account material, internal research and development documents, business plans, financial data and competitive intelligence.

b) Other company is looking beyond content aggregation and access capabilities and seeks to implement an infrastructure for collaboration and knowledge sharing. Some organizations want to extend their portal capabilities out to external users, including customers or business partners, through extranet implementations for B2B commerce, customer support and partner program support (Bhatt & Fenner, 2001).

2.7 How to Plan a Portal

When a portal project is started, one must first ask whether to build or buy. About half of portal projects are still "home-grown". Building up a portal from scratch

takes a lot of skills as operating systems, Web servers, databases, LDAP directories are all involved. Building up a portal is difficult from an application layer standpoint. Besides that, ERP, content management, collaboration systems all have to tie into a single interface (Hurley, 2001).

To build a portal, one must firstly decide what extraction tool is to be used to retrieve data from within the company data sources. The developer need to be aware that the ERP (Enterprise Resource Planning) systems. Often, the information in an ERP system is not as complete as it needs to be for the certain purposes and has to be appropriately packaged for planning.

Data model needs to be decided too in planning for building up a portal. Understanding the relationships between the company's organizational structure and legal structure is a compulsory knowledge that must be done. The decision on what reports and analysis will be needed for planning a portal have to be done too in this process. This is to determine whether there is in-house expertise to create them or not.

Another way to plan a portal is to determine if there are any off-the-shelf packages that can be integrated into the portal that need to be set up and need to decide whether it is sophisticated enough for planning purposes.

A web infrastructure needs to be creative too in the planning process. This should include customized interfaces for different people who will be accessing the portal, a collaborative working environment and security model (Trombly, 2001).

The packaged portal software usually does not come with tools to build pages but relies on Web authoring tools based on standards like Active Server Pages and Java Server Pages. Most packages come with pre-built bundles of portal functionality or "portlets". Portlets provide 80% of the functionality companies need for deployment. So most portal projects using packaged software are slated to take a year or less to implement. Home grown portals, usually, can be quicker because they are less complicated and robust.

In the planning process, the important factor to be considered is who will have access to the portal. The majority of portals are still "within the firewall" of companies but some are being developed for partners and customers. There are fewer risks when keeping a portal internal as the new technology is tested on employees not customers (Hurley, 2001).

2.8 Vendors in Portal Software

In the portal software market, there are IT juggernauts such as IBM, Sun Microsystems, BEA and Oracle who develop portals through selling application servers. There are also newer companies such as Plumtree and Epicentric who specialize in portal software. Vendors such as IBM, BEA and Sun are targeting

customers who are making "architectural decisions". Such customers may need middleware, application servers or EAI servers. Vendors like Plumtree offer "just portals". Portal software from application vendors may be advantageous for major new projects that need deep integration in the back-end systems. For example, Oracle's portal product, Oracle9iAS Portal, works only on the Oracle 9i application server. Such a situation offers a tighter integration and easier management. Security is also much easier when all the components come from the same company. It is important for companies to choose a portal which can be synchronized with all types of databases, operating systems, application servers and single sign-on software because all companies have different IT infrastructures. So when choosing a portal, one company needs to consider its needs for the future and not just for the needs of today (Hurley, 2001).

2.9 Existing Company Portal In The Market

There are many examples of company information portals in the market. Some are developed locally and some from overseas company. But the main purpose of the portals is still the same that is, to provide information to the users.

A few portals have been identified from the Internet. The first four Web sites are from different companies which provide information to the users through the Internet and the last two Web sites are samples of company portals for Power utility companies. The report will also focuses on the modules to be developed, which is

the Company Information Portal for TNB Generation Sendirian Berhad by referring to different types of portals in the market.

The first Web site is a worldwide information technology based company named Microsoft Corporation which is a simple and user-friendly Web site. The second one is the worldwide film company named Kodak which provides a colorful and attractive Web site. The third Web site is an insurance company named Prudential Financial, which shows the basic function such as login for the user. The fourth Web site is an international petrol company named Shell which shows the basic needs of a company portal. The fifth Web site is one of the power station company based in Japan named Tokai Power Station. And the last but not least Web site is also a portal of a power station in New Zealand named Palmerston North Electric Power Station which gives a more complete needs for developing a Web site for power stations. All the Web sites above will be described in more detail as the following sections.

a) Microsoft Corporation

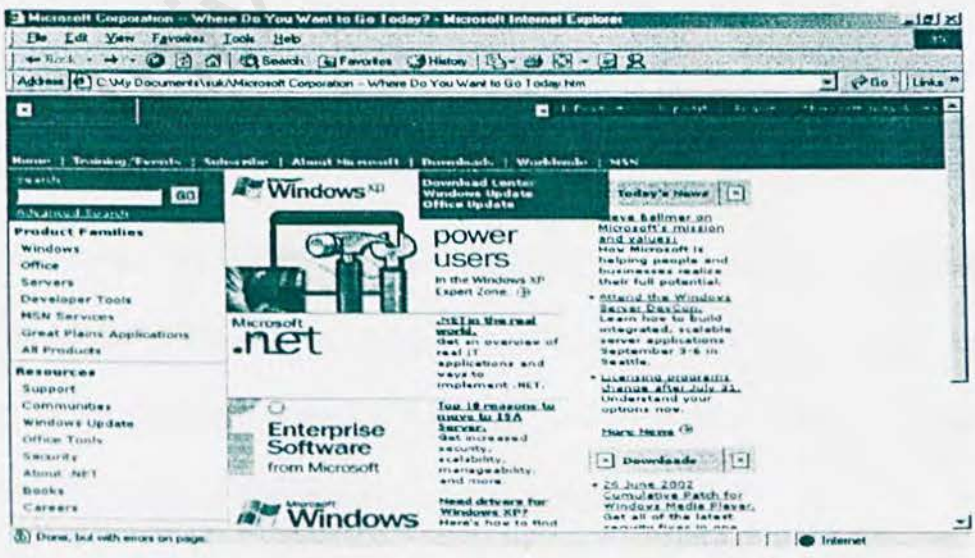

Figure 2.1: The Main Page of Microsoft Corporation

The first Web site is the Microsoft Corporation (Figure 2.1). The uniform resource locator (URL) address of this Web site is http://www.microsoft.com/ms.htm. This is a worldwide information technology base company. It provides information that users need including software, servers and others related product of the company.

Microsoft incorporates a *search* function. In the *search* menu, user can type in the necessary software and hardware related to the company itself. The *search* menu would ease information search of a user. The Web site categorizes their company information such as *Product Families*, *Resources*, and *Information*.

In the *Product Families*, users can review the product of the company such as *Windows*, *Office*, *Servers*, *Developer Tools*, *MSN Services* and others. By clicking on any of these menus, users would be able to get information they need. For example, by clicking the *Windows* in *Product Families*, all the products for *Windows* will be displayed. Besides that, it also shows the *Technologies* used like *Internet Explorer*, *Windows Media Player* and *DirectX*. It will also show the *Resources*, *Security*, Previous Versions, *and Related Products* for *Windows*.

Under *Resources*, the Web site offers such information as *Support*, *Communities*, *Windows Update*, *Office Tools*, *Security*, *About .Net*, *Books* and *Careers*. In the *Support* menu, there are functions like *Self Service Support Options*, *Fund and Download Software*, *Microsoft Services* and *Contact Microsoft*.

Under *Information*, the portal provides information for the *Home/Home Office*, *IT Professionals*, *Developers (MSDN)*, *Small Business*, *Microsoft Partners*, *Educators* and *Journalist*. A full descriptions will be given when the user click on the menu in the *Information* part.

In general, the Microsoft Corporation Portal is well structured and pleasurably presented to its users. It has an appealing main page and simple color combination for the whole Web site. It provides user-friendly functions to all users and users can easily choose certain needs by just clicking onto the menu.

One of the weaknesses of this Web site is that it does not provide many multimedia contents such as images, audios and videos. The reasons for this maybe because it is a commercial-based Web site that just need to inform most of their products and services.

This Web site is developed using Active Server Page (ASP) and JavaScript language. Both of the languages are best for developing Web site.

b) Kodak.com

Figure 2.2: The Main Page of Kodak.com

The second Web portal is a film online system (Figure 2.2). The URL address for this portal is http://www.kodak.com. This portal is a worldwide film company.

Kodak incorporates a *search* function. In the *search* menu, user can type in the necessary products of the company. Besides that, there is a *site directory* menu that allows users to directly search the selected products of the company. There are few main parts in the Web site that categorizes the company information such as *Products*, *Service*, *Support & Downloads*, *About Kodak* and *Kodak Worldwide*.

By clicking the *Products* option, users could locate the products using three simple ways. The users can choose the products which are displayed out alphabetically. Besides that, users can also search products by selecting type of product which has been arranged in the pull down menu. For example, there are a few types of products

Besides that, users can also search products by selecting type of product which has been arranged in the pull down menu. For example, there are a few types of products such as accessories, batteries, cameras, digital cameras and others. The third way of searching the products available is through typing the necessary product's name in the column provided in the *search for a product* menu.

In the *Service, Support & Downloads* option, there is a pull down menu for the download category. There are a few categories in it such as digital cameras for consumers, digital cameras for professional and digital video cameras. There is also a *support by product* function, which is mainly for users to know the products supported by the company. There is also a *popular support topics* that let users know something about the latest topics being discussed on certain products.

The *About Kodak* option displays a few items, which are useful information such as 2001 *Annual Report*, *Business Groups & Units*, *History of Kodak*, *Investor's Center*, *Careers at Kodak*, *Press Center*, *Events & Sponsorship* and others. In the Kodak portal, products by the brands in the different countries can also be acceded.

Overall, this portal's design is simple and does provide the basic function that is necessary for a company portal. It has a pleasant color combination that makes users feel comfortable.

prevalent information overload problem does not happen. Users tend to forget and loose attention of information when scrolling down a number of pages.

c) Prudential Financial

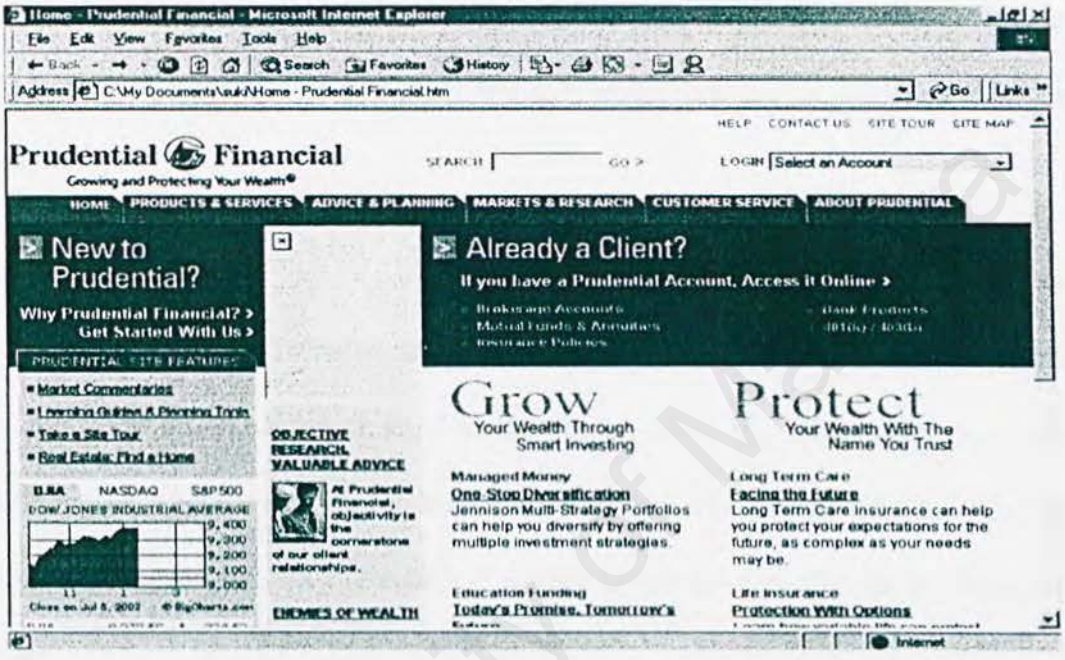

Figure 2.3: The Main Page of Prudential Financial

The third portal is a financial company which provides several services and information to users (Figure 2.3). The URL address for this portal is http://www.prudential.com. This site provides insurance information to users who are new to the company, Prudential and for the users who already has an account with the company.

There are a few main functions in the main page of the Web site which is *Products & Services*, *Advice & Planning*, *Market & Research*, *Customer Service* and *About Prudential*. In *the Products & Services* menu, it shows the different type of policies

There are a few main functions in the main page of the Web site which is *Products & Services*, *Advice & Planning*, *Market & Research*, *Customer Service* and *About Prudential*. In *the Products & Services* menu, it shows the different type of policies that the company has in the market. For the *Advice & Planning*, user could get the information about the importance of certain policy and some advice would be given to the customers. In the *Market & Research*, it just provides information about research on the policies of the company that would boost user confidence on the company.

For the *Customer Service* menu, users can type in their enquiries about the company and the question would be directed to the person in-charge. The person in-charge could reply the question posted to them once they received it. Besides that, users can also view the company background and history by clicking on the *About Prudential* menu.

This main Web site shows the *site map* of the company through out the country. Users would be able to view the company's location by choosing certain countries. For users who are already the customer of Prudential, they can *login* to the account such as mutual funds & annuities, insurance policy, and others to view the information available. At the bottom of the main page, users could get an insurance quotation by choosing form the pull down menu such as life or auto. A quotation will be given to the customer after they have chosen and a price list will be displayed.

the arrangement of the each function is confusing and not done in a proper manner. So this will makes the user feel uncomfortable about the Web site.

This Web site has been built up using the programming language such as Active Server Page and JavaScript, which is suitable for developing a web portal. Both of this language can also be easily understood.

d) Shell

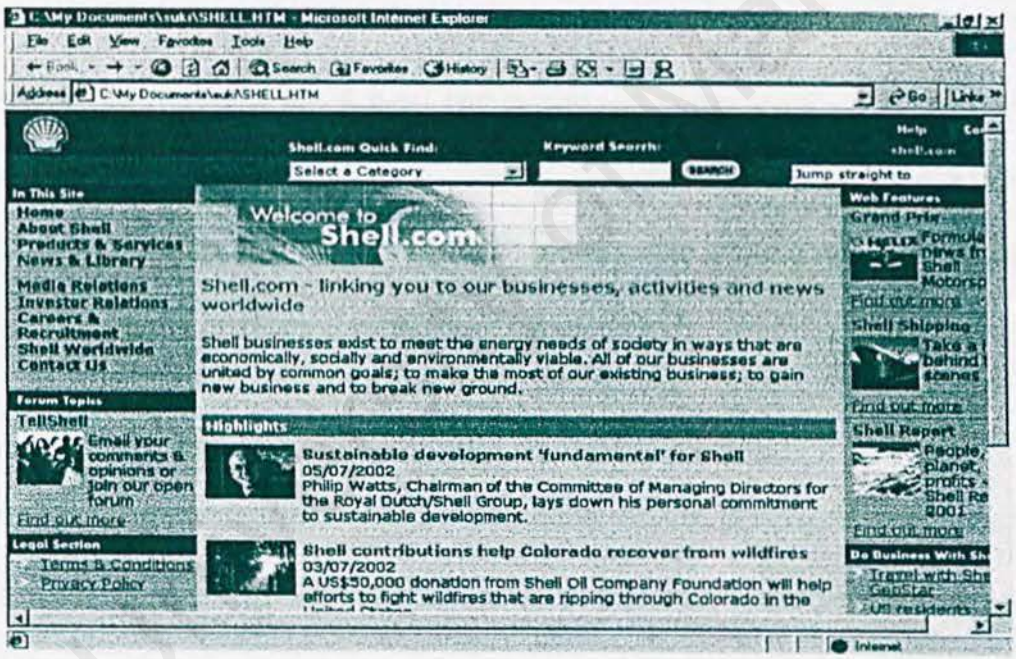

Figure 2.4: The Main Page of Shell

The fourth portal is a well-known petrol company in the world name Shell (Figure 2.4). The URL address for this Web site is http://www2.shell.com/home/Framework. The Web site, Shell is worldwide petrol company.

There are a few basic function provided in the main page of this Web site such as *About Shell*, *Products & Services*, *News & Library*, *Careers & Recruitment*, *Shell Worldwide* and others. By clicking on the *About Shell* menu, users could get the information about the history of the company. For the *Products & Services*, users can view by selecting or typing the products they need. For the *Careers & Recruitment*, users can view vacancies available in the company so that they could easily apply the job online. For the Shell Worldwide, users can get the information for the headquarters and offices of the company all over the world. If users has any enquires, they can simply click on *Contact Us* to post in their questions.

In general, this Web site has a good combination of colors because the symbolic yellow reflects the company's image. Besides that, the Web site is arranged in a proper order and it looks neat. Most of the basic function is also provided to ensure the necessary needs of the customers is catered for.

One of the major weaknesses of this Web site is the lengthy pages. Users need a large amount of scrolling and may affect users' concentration when scrolling around in the page.

e) Tokai Power Station

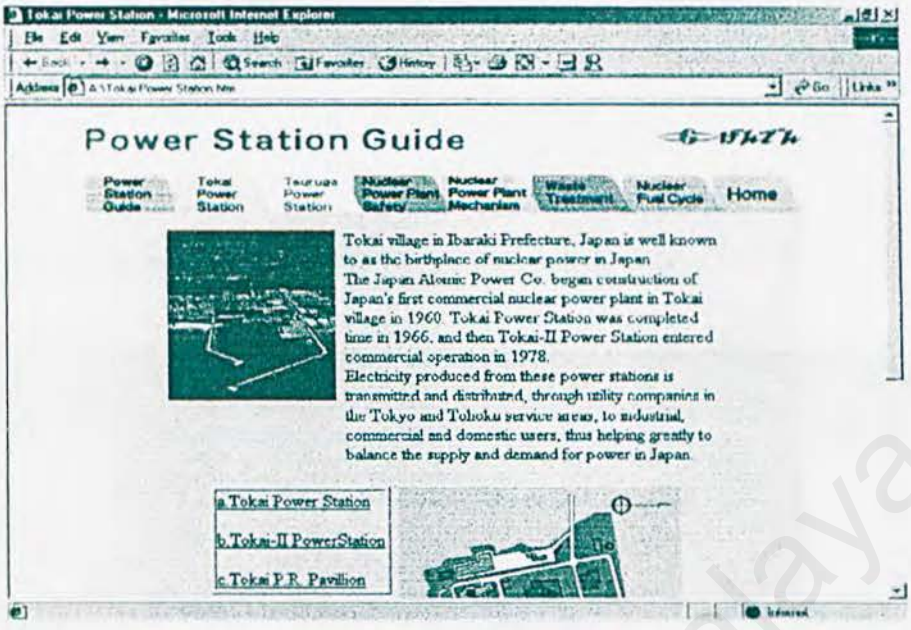

Figure 2.5: The Main Page of Tokai Power Station

The fifth portal is the Web site for Tokai Power Station (Figure 2.5). The URL address of this Web site is http://www.japc.co.jp/. This is a Web site for the main power station in Japan which is located in Tokai.

Overall, this Web site showed a very simple display with just a few basic menus. This portal displays the picture of the power station that gives the users a rough idea about the structure of the power station. Besides that, it also contains the three sub power station, available in Tokai. Users can easily click onto it and get the background information about the power station. The radiation monitoring around the power station is also been displayed in the main page. This will give further information to the users about the power station.

One of the weaknesses about this Web site is the simplicity of the functions, which did not fulfill others necessary needs of users such as the enquiry part, the search function and others related.

f) Palmerston North Electric Power Station Inc.

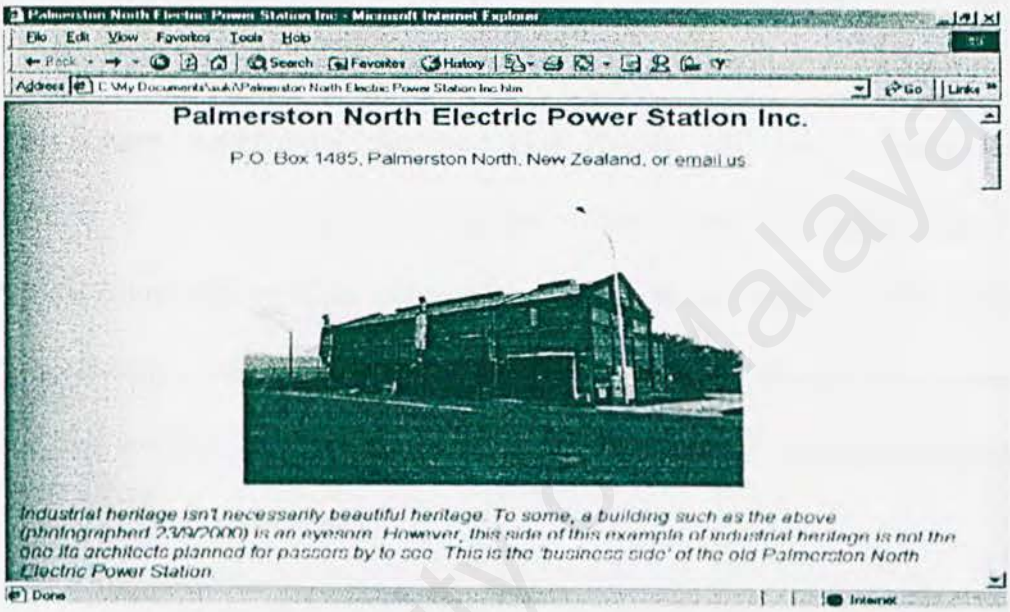

Figure 2.6: The Main Page of Palmerston North Electric Power Station Inc.

The sixth portal is the Web site for Palmerston North Electric Power (Figure 2.6). The URL address of this Web site is http://www.geocities.com/pnpowerstn. This is a Web site for the main power station in New Zealand, which is located in Keith Street, Palmerston North.

Overall, this Web site showed a few menus in the main page such as *Where are we?*, *The Beginning*, *The Engines*, *The Politics*, *Progress*, *Significance & Developments* and *Our Aims*. All these menus give the overview information about the power station from the beginning, which includes the location, when this power station was

built, the numbers of engines used, the progress over the years and the main aims of the power station.

This portal also includes more detail information such as *Historical*, *Technology*, *Pictures*, *Layout*, *Events*, *Activities* and *Other*. In the *Historical* menu, there are two sub parts as *An Historical Overview of the Power Station* and *Former Power Station Staff*. In the *Technology*, there are more sub titles which includes *The British Polar Engine – some background*, *National Gas Engine Co. Ltd – background*, *Background to our (former) National Suction – Gas Engines* and others more. For the *Photo*, it just displayed the photo album of the power station. There are few items in the *Layout* such as *Map of Palmerston North Power Station*, *Floor plan of the building in 1924*, *Compared floor plans in 1924 & 1936*, *Upstairs/downstairs blueprints 1924* and *Architecture*.

For the *Events*, it displayed out the current events had been held by the power station. For the *Activities*, it contains the *Progress Report: The (ongoing) Joys of Restoration*, *Membership of PNEPS Inc.* and *Visit the power station*. In the *Other*, there are *Online Newspaper Links*, *Recommended Links* and *Please visit our Guestbook* item.

In general, this Web site is a plain Web site which provides the basic functions for users when visiting this site. The color combination used is simple and all its

function is also user-friendly. Users can easily get the information they need by just clicking onto it.

One of the weaknesses of this portal is that it is not updated from time to time. So users will not be able to get current information.

2.10 Summary Features that can be incorporated

Web sites (URL)	Features that will be incorporating
http://www.microsoft.com/ms.htm	1. Simple and attractive user interface. 2. Simple search-retrieval methods (*Search*). 3. Well-structured categories of collection products.
http://www.kodak.com	1. Colorful and user friendly interface. 2. Simple and basic structure of the functionality provided.
http://www.prudential.com	1. Provide the site map of the company through out the countries. 2. User can be able to get their information about insurance, stock exchange and others easily.
http://www2.shell.com/home/Framework	1. Symbolic color is used to represent the company.
http://www.jape.co.jp/	1. Attractive user interface by providing the structure plan of the power station.

	2. Providing a simple to use web site by just clicking on certain button to access the information they need.
http://www.geocities.com/pnpowers tn	1. Simple and functional user interface. 2. Providing the basic function that fulfills the necessary needs of a user.

Table 2.1: Summary Features From the Reviewed Web Sites

Chapter 3

METHODOLOGY

3.1 Project Plan and Method

A development strategy can be referred as the software process model or the software engineering paradigm which is incorporated in the project plan. Software process model is defined as a framework for the tasks that are required to build high quality software. It describes the way software development should progress and the way software development is done in reality. Therefore, it forms a common understanding of activities, resources and constraints that are involved. Besides that, it also helps to identify inconsistencies, redundancies and omissions so that the development process will become more effective and efficient (Pfleeger, 2001). This will ensure the success of a project.

There are few popular software process models such as Waterfall Model, V Model, Waterfall Model with Prototyping, Prototyping Model, Transformation Model and Spiral Model. There is no distinction which model is the best among all the models for project development. Each of the models has its own strengths and weaknesses. Each model is dependent on various factors such as resource availability, project complexity, requirements volatility and others.

For this project, the Prototyping model is chosen. This is because Prototyping is a useful model for projects of medium complexity that focuses on the user needs and requirements. Generally, Prototyping model is defined as a rapid development and

testing of spike solutions based upon known requirements for user review (SENG 611 – Technique Summaries, 1998).

System development may begin with a nominal set of requirements supplied by the TNBG's users by providing necessary information on developing the Company Information Portal. Then alternatives are explored by having interested parties look at possible screens, tables, reports and other system output that are used directly by the TNBG's users. As users decide on what they want, the requirements are revised. Once there is common agreement on what the requirements should be, the developers will move on to design. Again, alternative designs are explored, often with consultation with TNBG's users.

The initial design is revised until the developers, TNBG's users are satisfied with the result. Indeed sometimes considering design alternatives reveals a problem with the requirements and the developers drop back to the requirements activities to reconsider and change the requirements specification. Eventually, the system is coded and alternatives are discussed, with possible iteration through requirements and design again.

The prototyping model is showed in Figure 3.1.

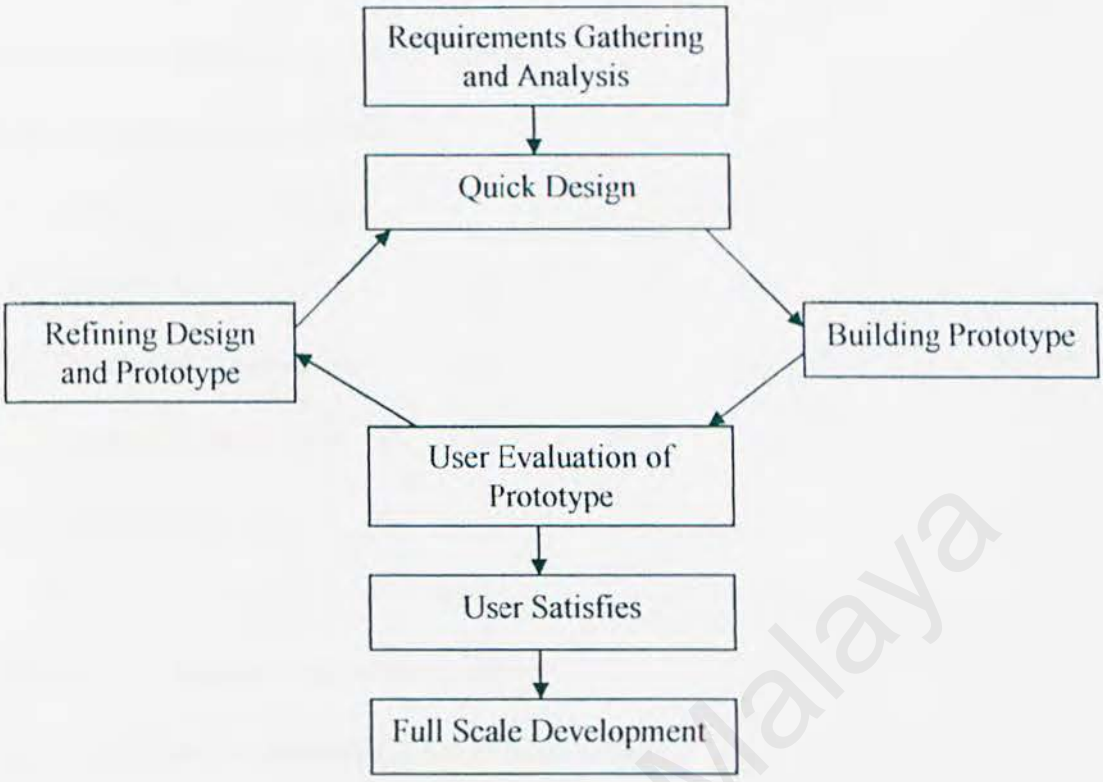

Figure 3.1: The Prototyping Model

The rationale for applying this software process models comes from a very basic problem-solving approach. It is believed that is very important for the users to get an idea of how the system will function and for the developers to understand what are required.

3.2 Information-Gathering Approach

System analysis is the process of gathering and interpreting facts, diagnosing problems and using the information to recommend improvement the system (Gary, 1998). The information gathering is one of the phases of the system analysis. It was carried out in order to gather relevant information to determine the requirement of the system. For the proposed system, several traditional information gathering

approach have been carried in order to determine the current condition of existing system and the opportunity for improvements.

The fact-gathering techniques are:

- Analyzing system output
- Interviewing
- Document Observation
- Internet Surfing
- Observation

The purposes of information gathering are to:

- Understand the functions of the current system.
- Check the errors for the current system.
- Identify the actual need of the user.
- Look for opportunities for improving the effectiveness of the current system.

3.2.1 System output analyses

It is an investigation activity on the data that have been produced by current system in order to understand the information requirement for a particular organization. Sometimes, it can make developer understand a system by observing it in operation. Seeing the system in action gives the developer additional perspective and a better understanding of the system and its procedures (Hoffer, 1999). For the proposed system, the data observation have been carried out to investigate the deficient system on data collection such as the lack of important information or the lack of the information that would potentially interest the system users.

3.2.2 Interviewing

An information-gathering interview is a directed conversation with a specific purpose that uses a question and answer format (Pfleeger, 2001). Interview is a very complex information-gathering technique that takes into account personal biases and perceptions. Some of the unique types of information that are obtained from interviews are the respondent's opinion, feelings, goals and informal procedures (Kendall & Kendall, 1999).

An informal information-gathering interview was conducted in order to gather the information about the current system. Interview were carried out with a number TNBG's users. Along the interview, opinion about the necessary information to be added in the Company Information Portal has been carried out.

Information that have been gathered from the TNBG's user such as history, mision, vision, projects have been done and other related information. Information about the procedures on how the task is performed, including data and information thatin needed, time that task will be taken and the effectiveness of the current systemwas analysed. The opinions of the interviewee and his/her feelings about the current state of the system expectations of the new system and personal goals and informal procedures was analysis and will be used as a guide for the development for this project (see Appendix for the questionaire used).

3.2.3 Document Observation

This was carried out in order to determine the features of a good directory, including data information, data arrangement and presentation which would guide the design

of the output of the proposed system. Besides that, some document from the document room of the faculty have been referred to get some useful information. All the information that have been gained is mostly related to company portals that is going to be developed.

Printed rsources especially journal articles were used to obtain information about definition of terms, concepts and research activity in the area of company information portal. This knowledge has increased the understanding of basic features required.

3.2.4 Internet or Online References Resource

Internet is a source that some current pontential information can be gained in an efficient way. Its current potential as a new information-focused technological advancement is just a scratch of its surface. Some of the useful things that can be found on the Internet are huge numbers of information topics ranging from company financial reports to conference proceedings and academic researches as well as other useful services such as forums, emails, discussion lists, search engineds, databases and subject gateways.

There are many similar systems that are currently available on the Internet that is related to the company portal that is going to be developed. These systems have been studied in order to gather information and to determine system requirements in the system design process. The good features of the systems will be adopted to the proposed system to improve the system performance. The analysis and synthesis of the systems were emphasized in chapter 2.

Based on the gathered information, the systems requirements were determined and identified. In the next chapter, the explanations for the system functional requirement and non- functional will be described.

3.2.5 Observation

Observation of the environment at TNBG is one of the information-gathering approach that has been used all this time. By observing the environment of TNBG, some information such as the building surrounding, the projects undertaken, the working attitudes of the workers and lots more can be gained. All this information can be upload into the company portal which is the main resources.

Chapter 4

SYSTEM ANALYSIS

4.1 User Requirements Specifications and Analysis – Functional and Non-Functional

A requirement is a feature of the system or a description of something the system is capable of doing in order to fulfill the system's purpose (Pfleeger, 2001). Figure 4.1 illustrates the process of determining the requirements for a system.

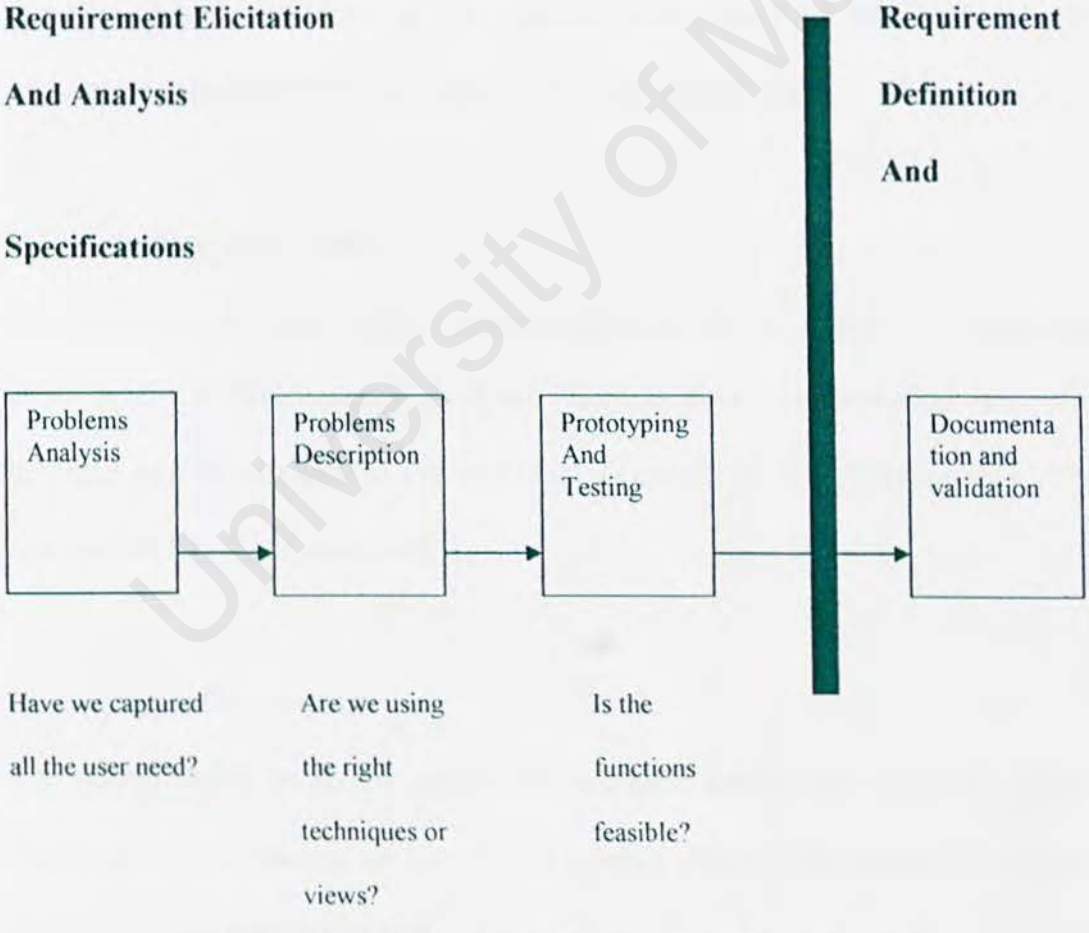

Figure 4.1: The Process of Determining Requirement

4.1.1 Functional Requirements Analysis

Functional requirement are functions or subsystems that are mandatory to the system. A functional requirement describes an interaction between the system and its environment. Further, functional requirements describe how the system should behave when given certain stimuli. The following are the functional requirements for the proposed company information portal for TNBG:

a) Company Profile

Provides and displays the company's background for the three different station of TNBG that is Prai, Gelugor and Teluk Ewa (Langkawi). Besides that, it also provides information such as the mission and vision of the company. The organization structure of the company will be also shown in this particular module.

b) Projects for TNBG

The portal should enable user to gain information for the projects that have been done by the TNBG recently in detail. Besides that, environmental issues and activities will be uploaded in this module. ISO certification information that TNBG has applied for displayed as well.

c) Departmental Unit

The system should be able to display the two main department in TNBG, which is Electrical and Instrument section. It will roughly display the information includes activities going on in the section.

d) Statistical Information

The statistical information feature provides an efficient, powerful and easy way to retrieve users' desired information such as the statistical survey on the annual company growth, installed capacity of the previous years, availability and efficiency percentage for the previous years.

e) Photo Gallery

The proposed company portal should include the photo gallery. This photo gallery can let the user view the photo, which includes the TNBG environment, turbine, boiler and some activities in the TNBG such as ISO.

4.1.2 Non-Functional Requirements Analysis

Non-functional requirements are the constraints under which a system must operate and the standards which must be met by the delivered system (Sommerwille, 2001). The concluded non-functional requirements of *Company Information Portal of Tenaga Nasional Berhad Generation, Prai* are:

- User-friendliness
- Flexibility
- Efficiency
- Reliability
- Availability

a) User-Friendliness

User-friendly interface is important to help the users to use the system confidently and easily. This feature is required because the majority of the potential users are not

technologically inclined. They are non-technical and will be easily frustrated with complicated computing features and commands. Therefore the design for the interface, linkage between modules must have a high overall view. It should consists the follow features:

- Attractive, simple and easy to use interface design.
- Systematic standard Window Graphical User Interface (GUI).
- Field description for every window component.
- Module browser to allow users to shift among the system modules.
- Online help functions to assist new and inexperienced users in using the system.

b) Flexibility

The system must possess the capability to take advantages of new technologies and resources and can be implemented in changing business environments. It should be able to enhance for any requirement.

c) Efficiency

The system should have ability to be called to produce or process certain operation at an acceptable or credible speed. With thousands of users accessing the web site at the same time, it is vital that the system should be robust in handling huge databases under time constraints. With the increment of the number of system entrants, the database also must be able to produce good performance.

d) Reliability

Reliability is the extent to which a system can be expected to perform its intended function with required precision and accuracy. A system is reliable if it does not produce dangerous or costly failures in the typical user environment and data integrity is preserved. This feature is so important for an online directory because the data in the system database must be accurate. The data integrity and confidentiality must be protected. Users look for accurate and appropriate information from the system and the failure to provide these features would frustrate users.

e) Availability

The system should be developed in a way that it could be accessed at anytime and anywhere. This feature is important for an online system because the purpose of an online directory is to provide convenience for entrants to do data modification and users to search the desire data from the particular organization.

f) Consideration on System Development Tools

An analysis on several selected system development tools have been carried out to determine, discover and study the offered features and capabilities for use for this project. These tools include:

- Operating System
- Web Server
- Web Database
- Web Application Programming Technology
- Web Programming Language

- Web Application Development Tools

The tools are checked and analyzed for their suitability in certain aspects such as its simplicity, ease-to-use and comprehensiveness.

4.2 Hardware and Software Consideration

4.2.1 Development Platform

a) Microsoft Windows NT Server 4.0

Microsoft Windows NT Server 4.0 is a multipurpose server operating system and a network foundation for the future, designed to meet the most demanding requirements of today's business computing world. Windows NT Server is also the easiest network operating system to set up, manage and use. A multipurpose operating system integrates a variety of network services. The services it provides are designed to address customer requirements and are managed in a single way.

This robust, multipurpose network operating system offers dependable file and print services, while providing the architecture to run powerful client-server applications. With built-in support for communications and Internet services, Windows NT Server is the only network operating system that includes Internet and intranet capabilities. The new features built into Windows NT Server offer better communication by providing more choices for accessing information – especially through a wide range of built-in Internet tools. The new features also provide users with easier, lower cost networking and improved performance. Windows NT Server inter-operates with a broad range of the operating system including Netware, UNIX, Microsoft LAN Manager, SNA and Macintosh.

The features of Windows NT Server 4.0 are:

i. Support more protocols and file sharing

ii. Easy and simple setup and management

iii. Integrated security

iv. Easy Integration

v. Integrated Web Server (IIS – Internet Information Server)

vi. Faster access to information

vii. Complete communication services

viii. Fast reliable and secure

ix. Low cost dial-up connectivity

b) Microsoft Windows 2000 Server

Windows 2000® Server is the multipurpose network operating system for businesses of all sizes. The newest version of the best-selling server operating system, Windows 2000 Serverprovides users to:

- Share files and printers reliably and securely.
- Choose from thousands of business applications compatible to run today on Windows 2000 Server.
- Build Web applications and connect to the Internet.

The Windows® 2000 Server operating system is designed to increase the value of existing investments while lowering overall computing costs. Specifically, Windows® 2000 Server is easier to deploy, configure, and use because it provides centralized, customizable management services to reduce total cost of ownership (or TCO). TCO includes not only the initial cost of hardware and software, but deployment expense, hardware and software update costs, training, day-to-day

maintenance, and technical support as well. Further, these management services work with existing management solutions and mixed-platform distributed networks, thus allowing the organization's IT department to get maximum value from their current infrastructure.

The features of Windows 2000 Server are:

i. Easy to Deploy

ii. Easy Network Configuration

iii. Easy Daily Maintenance

iv. Centralized Management Services

The Benefits of Windows 2000 Server are:

i) Multitasking

Multitasking enables users to run multiple applications simultaneously on the same system. The number of applications that a user can run simultaneously and the system performance when running them depends on the amount of memory in the system.

ii) Memory support

To function, each application that runs on Windows 2000 requires a certain amount of memory. In order to support multiple applications running simultaneously (multitasking) and applications with large requirements for memory, Windows 2000 provides support for up to 64 GB of memory.

iii) Symmetric Multiprocessing (SMP) Scalability

SMP is a technology that allows an operating system to use multiple processors simultaneously to improve performance by reducing transaction time. Depending on the version, Windows 2000 provides SMP support for up to 32 processors.

iv) Plug and Play

With Windows 2000, it is easy to install a Plug and Play device. This device provides plug ins and can be used immediately without having to perform a complicated setup process. After plugging in such a device, Windows 2000 automatically identifies the added component and completes the configuration.

v) Clustering

Windows 2000 provides the ability to group independent computers together to run a common set of applications. This grouping appears as a single system to the client and application. Such a grouping is called clustering, and the groups of computers are called clusters. This arrangement of computers avoids a single point of failure. If one computer fails, another computer in the cluster provides the same services in its place.

vi) File System Features

The NTFS file system is recommended file system for use with Windows 2000. Windows 2000 provides the following features through NTFS support:

- File system recovery
- Large partition size
- Security
- Disk quotas

- Compression

vii) Quality of Service

In Windows 2000, Quality of Service is a set of service requirements that the network needs to ensure an adequate service level for data transmission. Using QoS provides a guaranteed, end-to-end, express delivery system information across the network.

viii) Terminal Services

Terminal Services provides remote access to a server desktop through a terminal emulator. A terminal emulator is an application provides access to a remote computers. Using Terminal Services, one can run client applications on the server so that client computers function as terminals rather than as independent systems.

ix) Remote installation Services

Remote Installation Services (RIS) enables an administrator to deploy an operating system throughout the organization, without needing to physically visit each client computer. RIS is an optional component that is available as part of Microsoft Windows 2000 Server operating system.

Microsoft Windows 2000 Server provides several services. The services include:

- *Group Policy* control user access to desktop settings and applications by group rather than by individual user and computer. Also one could define and control the amount of access users have to data, applications, and other network resources.

- *Windows Management Instrumentation (WMI)* provides unified access and event services, allowing one to control and monitor Windows-based environments, Simple Network Management Protocol (SNMP) devices, and all host environments that support the Web-Based Enterprise Management (WBEM) standards initiative of the Distributed Management Task Force (DMTF).
- *Windows Script Host (WSH)* allows one to automate and integrate common tasks using a variety of scripting environments including Microsoft® Visual Basic®, Scripting Edition (VBScript), Microsoft Jscript®, and Perl. This feature includes direct scripting to Active Directory and WMI.
- *Microsoft Management Console (MMC)* gives one a common user interface presentation tool where one can integrate all the necessary Windows-based and Web-based administration components needed to fulfill a specific task

So Microsoft Windows 2000 server is chosen as the development platform of this project.

4.2.2 Web Server

a) Microsoft Internet Information Server 5.0

Microsoft Internet Information Server (IIS) 5.0 is a web server that enables you to publish information on a corporate intranet or on the Internet. IIS 5.0 is built-in in the Microsoft Windows NT Server 4.0. IIS transmits information by using the Hypertext Transfer Protocol (HTTP). IIS can also be configured to provide File Transfer protocol (FTP) and Gopher services. The FTP service enables users to transfer files to and from your web sites. The Gopher service uses a menu-driven

protocol for locating documents. The Gopher protocol has been largely superseded by the HTTP protocol.

Below are the features of IIS 5.0:

- Reliability and performance

A number of features make IIS more reliable and performs better. To make it faster and easier to restart IIS, the reliable restart feature of IIS 5.0 allows an administrator to restart Web services without rebooting the computer. To improve reliability, Application Protection provides the ability to run applications in a pool, separate from the Web services. The new CPU Throttling and Socket Pooling features in IIS 5.0 can also improve reliability. For application developers, Web site performance can be improved through new features such as scriptless Microsoft Active Server Pages (ASP) processing, ASP self-tuning, and performance-enhanced ASP objects.

- Management

IIS 5.0 is easier to install and maintain. A number of features support this ease-of-maintenance, which includes a simplified installation process, new security task wizards, the ability to account for time used by processes, more flexible remote administration, and the ability to create custom error messages.

- Security

IIS 5.0 adds support for important industry-standard security protocols, including Digest Authentication, Server Gated Cryptography, Kerberos V5 authentication protocol, Transport Layer Security, and Fortezza. In addition, three new task wizards make it easier for administrators to manage a site's

security settings. Information on steps one can take to prevent one's IIS server from being exploited by hackers will also be presented.

- Application environment

Developers will find that IIS 5.0 expands the Web server's application development environment by building on new technologies included in Windows 2000 Server. These include Active Directory and the expanded Component Object Model (COM+). In addition, enhancements to IIS Active Server Pages, such as scriptless ASP processing, as well as improved flow control and error handling, let developers write more efficient Web-centric applications.

b) Apache Web Server

Form its humble beginning in early 1995 as a set patches to the original NCSA (National Center for Supercomputing Applications) web serve, the Apache Web Server has steadily increased in popularity as well as power and capability. The Apache Server was one of the first web server to implement the HTTP/1.1 protocol. The Apache server has become established as the dominant web server, from outpacing commercial offerings from the giants Microsoft and Netscape.

The Apache is popular due to its features such as:

- Flexibility

Apache can be easily customise due to its modular architecture. The most commonly used modules are contained with the Apache source code and users can easily choose which ones to compile with the final application. However,

users can also find and download additional modules form the Internet or they can even create their own modules.

- Scalability

The server can support large systems. The server is used by many of the world's biggest and most demanding web site.

- Cutting-edge

Because essentially its user community develops Apache, it is always one of the first web server to support new standards and new technology. It was among the first to support virtual hosting and browser matching and the Apache server version 1.2, was the first to support the HTTP 1.1 standard. This standard allows web sites to identify themselves with a header instead of an IP address, making it much easier to use multiple domain names on a single host.

So Microsoft Internet Information Server (IIS) 5.0 is chosen as the web server of this project.

4.2.3 Database Management System

a) Microsoft Access 2000

Whether users are creating a stand-alone desktop database for personal use, departmental use or for an entire organization, Access offers an easy-to-use database for managing and sharing data. Access 2000 brings not only the traditional broad range of easy data management tools but also adds increased integration with the Web for easier sharing of data across a variety of platforms and user levels and additional ease-of-use enhancements to assist with personal productivity. Access

2000 used the application as the front end of high-end database engines such as Microsoft SQL Server. Yet Access 2000 is easier to use than its predecessors. (Microsoft Access, 2000).

Microsoft offers a full family of database tools for the desktop, the server, and for open connectivity. For the desktop Microsoft offers Microsoft Access 2000. The Microsoft Access 2000 is a full-featured multi-user relational database management system that designed for the Microsoft Windows operating systems (such as Windows 9x, Windows NT, Windows 2000). Access 2000 is extremely visually oriented and easy to use. It makes extensive use of drag-and-drop and visual design for queries, forms, and reports (Gary N., 1999).

Access 2000 comes with an integrated development environment (IDE), including incremental compilation, a fully interactive visual debugger, breakpoints, and single step-through. These capabilities combine to make Microsoft Access an extremely powerful platform for developing client-server database solutions.

With the new capabilities in the Microsoft Access 2000 database management system, one can drop data into hypertext markup language (HTML) pages that can be shared and manipulated on the World Wide Web, making it to get important information.

Data access pages -- Similar to the classic Access forms and reports, data access pages are data-bound HTML files that can be designed in Access and used to view, edit, and report on data within a Web browser. Because they are stored outside the

database .mdb file, one can easily send data access pages through electronic mail or post them on a Web site.

Grouped data access pages -- By grouping data access pages into a collapsible hierarchical format, one can easily interact with related information.

Data Access Page Toolbox -- This toolbox makes it easy for the developer to grab the tools needed to create and format the data access pages.

Field List -- Drag and drop field names from this easily accessible list onto data access pages. Fields are bound to the data by a direct live link.

Integration of shared components -- User can incorporate these new Microsoft Office Web components into data access pages.

Spreadsheet component -- Provides a basic grid in a browser for entering text and numbers, creating formulas, recalculating, sorting, and applying basic formatting to data.

Chart component – Creates interactive charts tied to existing data that can be viewed in a browser, and automatically updates the charts as the underlying data changes.

PivotTable dynamic view -- Performs dynamic analysis on a DataPage so user can browse, sort, filter, and group data.

There are a few standard features for the Access 2000. Features such as:

- Convert Database to Prior Access Version

For the first time, Access users can now save a database into a previous version of Access, making it easier to share database files with users of different versions.

- Database Window

The database window was changed to accommodate the new objects exposed in Access 2000, to enhance usability and to be consistent with the new user interface metaphor used throughout Office 2000.

- Name AutoCorrect

Automatically resolves the common side effects that occur when a user renames a database object. Example, when a user renames a field in a table, the change is automatically propagated to dependent objects such as Queries.

- Subdatasheets

Subdatasheets provide a picture-in-picture view to focus on and edit related data all in the same window.

- Data Access Pages

This feature allows users to extend database applications to the corporate intranet by creating data-bound HTML pages quickly and easily. This will help users share information faster and more efficiently than ever.

b) SQL Server 2000

SQL Server 2000 provides agility to your data management and analysis, allowing organizations to adapt quickly and gracefully to derive competitive advantage in a fast-changing environment. From a data management and analysis perspective, it could turn raw data into business intelligence and take full advantage of the opportunities presented by the Web. SQL Server 2000 opens the door to the rapid development of a new generation of enterprise-class business applications that can give companies a critical competitive advantage. The record-holder of important benchmark awards for scalability and speed, SQL Server 2000 is a fully Web-enabled database product, providing core support for Extensible Markup Language (XML) and the ability to query across the Internet and beyond the firewall.

There are not many differences in the internal architecture between SQL Server 7.0 and SQL Server 2000. SQL Server 2000 has the same features as SQL Server 7.0 such as auto-grow features, new storage engine and complete row level locking. So, the general characteristics of these versions are the same.

SQL Server 2000 delivers a new generation of features and functionality that helps to adapt to ever-changing data management and analysis requirements. Great support for Web standards, powerful new tools for system management and tuning, and truly affordable scalability and reliability make SQL Server 2000 an attractive option to be adopted.

The strength of the SQL Server 2000 are as follows:

- Next-Generation Web Functionality

One of the most important design goals for the SQL Server 2000 team was to construct a database that provides all the tools needed to create powerful e-commerce applications quickly and easily. Enhancements to SQL Server 2000 start with the introduction of built-in support for Extensible Markup Language (XML) so that it can be stored and generated without complex programming. XML support vastly simplifies back-end system integration and allows for seamless data transfer, even across firewalls.

The ability to query and search database information has been improved in SQL Server 2000 as well. Security is a critical consideration for Web-enabled database applications. SQL Server 2000 delivers important new enhancements, starting with improved out-of-the box security based on the Microsoft Windows® 2000 security model. Additional upgrades include flexible role-based security for server, database, and application profiles; integrated tools for security auditing; and support for file and network encryption.

- Powerful New Data Analysis Tools

SQL Server 7.0 delivered robust analysis functionality with the introduction of OLAP Services. With SQL Server 2000, the Web OLAP cubes can now be accessed using Hypertext Transfer Protocol (HTTP), offering remote users, including suppliers and trading partners outside the intranet, the ability to use SQL Server analysis tools.

Analysis Services also offers key security upgrades, including the power to define security for cells as well as dimensions. Database administrators can now

define cell security by setting role options, providing control over access to data at virtually every level.

- Single-Seat Administration

The growing complexity of databases has contributed to the sharply rising cost of IT ownership. SQL Server 2000 introduces a wide range of new features aimed at simplifying database management. The result is a database product that offers true single-seat administration.

Query Analyzer has also been improved. In addition, the Transaction SQL (T-SQL) debugger allows for the control and monitor the execution of stored procedures, offering the ability to trace server-side statements and client-side statistics. Templates and an object browser make Query Analyzer a true SQL authoring environment for the full range of users.

Other upgrades include the new Copy Database Wizard, which allows one to copy and move databases without taking servers offline. SQL Server 2000 offers the industry's most powerful dynamic self-tuning capabilities, ensuring that companies will always enjoy optimum performance.

- Industry-Leading Scalability

Improving the scalability of SQL Server 7.0 was an important focus for the SQL Server 2000 development team.

The new features aimed at enhancing scalability include the ability to partition workload across servers on demand, support for high-end symmetric

multiprocessing (SMP) hardware, and indexed views. At the core of the improved scalability is tight integration between the database and the Windows 2000 operating system. Now, applications can be run on Windows 2000 multi-processor systems, providing power all the way up to 32 machines and 64 gigabytes (GB) of RAM.

- Highly Reliable

SQL Server 2000 includes a wide range of new and enhanced features to improve reliability and maximize uptime and therefore meets the needs of demanding e-commerce and enterprise applications.

- Fastest Time-to-Market

SQL Server 2000 is the data management and analysis backbone of the Microsoft .NET Enterprise Servers. SQL Server 2000 includes tools to speed development from concept to final delivery.

- ✓ **Integrated and extensible analysis services.** With SQL Server 2000, one can build end-to-end analysis solutions with integrated tools to create value from data. It is possible to automatically drive business processes based on analysis results and flexibly retrieve custom result sets from the most complex calculations.
- ✓ **Quick development, debugging, and data transformation.** SQL Server 2000 features the ability to interactively tune and debug queries, quickly move and transform data from any source, and define and use functions as if they were built in to Transact-SQL.

- ✓ **Simplified management and tuning.** With SQL Server 2000, it is easy to manage databases centrally alongside all enterprise resources.

So SQL Server 2000 is chosen as the database management system of this project.

4.2.4 Web Programming

a) Active Server Pages (ASP)

ASP is an HTML page that includes one or more scripts (small embedded programs) that are processed on a Microsoft Web Server before the page is sent to the user. An ASP is a server side scripting. It is similar to the Common Gateway Interface (CGI) application since it involves programs that run on the server, usually tailoring a page for the server.

The code inside ASP is mixed with standard HTML and will not be seen by the browser. ASP pages run in all browsers unless the person making the pages uses HTML or browser commands outside of the ASP options.

ASP are server-generated pages which can call other programs to access databases and serve different pages to different browser-basically. Typically, the script in the web page at the server used input received as the result of the user's request for the page to access data form a database and then builds or customize the page on the fly before sending it to the requester. ASP, is as efficient as writing code directly to the server's application program interface, and it runs as a server and can take advantages or multi-threaded architectures.

According to Microsoft Web Site, "ASP is an open, compile-free application environment in which HTML, scripts and reusable ActiveX server components can be combined to create dynamic and powerful Web Based business solutions. ASP has evolved into an "open technology framework'" which means it is not necessary to use Microsoft products to create codes in it. Nowadays, any language can be used to create ASP pages. ASPs can also take advantages of Com & DCOM (Component Pbject Model & Distributed Component Object Model) objects with minimum effort.

Any text editor can be used to create ASP code. Microsoft Visual Interdave will give a nice highlights, wizards and pop-up boxes. This is also the reason Microsoft Interdave is chosen as the Web Application Development Tool.

ASP solves all the problems associate with CGI and Server APIs. In addition to being just efficient as ISAPI applications, ASP is simple to learn and much easier to use. With ASP, the code can be simply written in the HTML page. The HTML tags and the code are side by side. There is no compiling and complex interfacing. ASP has made it much quicker and easier to create highly interactive web site. It also enable to pages easier for maintenance and updating in the future.

Although ASP is easy, there is a degree of learning involved in using it. ASP is not a software package like Microsoft Frontpage that one can simply buy from the shop. ASP is a technology in itself. It is a feature built in to different piece of software.

ASP enables server-side scripting for IIS with native support for both VB Script and Java Script. Knowledge on the C++ and Java programming will ease the learning of ASP technology. These languages can be used in ASP programming. The

conversion to VB Script is simple. Besides that, VB Script is the simplest language to use in the web site.

b) ASP.Net

ASP.NET is a programming framework built on the common language runtime that can be used on a server to build powerful Web applications. ASP.NET offers several important advantages over previous Web development models:

- Enhanced Performance

ASP.NET is a compiled common language runtime code running on the server. Unlike its interpreted predecessors, ASP.NET can take advantage of early binding, just-in-time compilation, native optimization, and caching services right.

- World-Class Tool Support

The ASP.NET framework is complemented by a rich toolbox and designer in the Visual Studio integrated development environment. WYSIWYG editing, drag-and-drop server controls, and automatic deployment are just a few of the features provided.

- Power and Flexibility

Because ASP.NET is based on the common language runtime, the power and flexibility of that entire platform is available to Web application developers. The .NET Framework class library, Messaging, and Data Access solutions are all seamlessly accessible from the Web. ASP.NET is also language-independent, so that one can choose the language that best applies and partition application across many languages. Further, common language runtime interoperability

guarantees investment in COM-based development is preserved when migrating to ASP.NET.

- Simplicity

ASP.NET makes it easy to perform common tasks, from simple form submission and client authentication to deployment and site configuration. For example, the ASP.NET page framework allows one to build user interfaces that cleanly separate application logic from presentation code and to handle events in a simple, Visual Basic - like forms processing model. Additionally, the common language runtime simplifies development, with managed code services such as automatic reference counting and garbage collection.

- Manageability

ASP.NET employs a text-based, hierarchical configuration system, which simplifies applying settings to the server environment and Web applications. Because configuration information is stored as plain text, new settings may be applied without the aid of local administration tools. This "zero local administration" philosophy extends to deploying ASP.NET Framework applications as well. An ASP.NET Framework application is deployed to a server simply by copying the necessary files to the server. No server restart is required, even to deploy or replace running compiled code.

- Scalability and Availability

ASP.NET has been designed with scalability in mind, with features specifically tailored to improve performance in clustered and multiprocessor environments.

Further, processes are closely monitored and managed by the ASP.NET runtime, so that if one misbehaves (leaks, deadlocks), a new process can be created in its place, which helps keep applications constantly available to handle requests.

- Customizability and Extensibility

ASP.NET delivers a well-factored architecture allows developers to "plug-in" their code at the appropriate level and extend or replace any subcomponent of the ASP.NET runtime with their own custom-written component.

- Security

With built in Windows authentication and per-application configuration, it is possible to secure application.

So ASP .NET is chosen as the Web programming of this project.

4.2.5 Web Programming Language

a) HTML

HTML or Hyper Text Markup Language, is a type of markup language originally used to publish information but not on the web. Because of the ease-to-use feature, it is a natural choice to distribute information on the web. An HTML document is just an ordinary text file but it consists of a set of "markup" symbols or codes inserted in a time intended for display on a World Wide Web browser. The markup tells the web browser how to display a web page's words and images for the user.

HTML standard is governed by a committee called the World Wide Web Consortium (W3C). Any changes and proposed changes on HTML can be found at their homepage. Currently the latest version is HTML 4.0.

HTML consists commands, called elements or tags, to make text as heading, paragraph, lists, quotations and so on. It also has tags to include images within the documents, include fill-in forms that accept user input and most importantly to include hypertext links connecting the document being read to other document or Internet resources, such as WAIS databases or anonymous FTP file. It allows user to click on a string of highlighted text and access a new document, an image or a movie file from a computer thousands miles away. This can be access through a URL, which is included in the HTML markup instruction, which is used by the user's browser to find the designated resources.

Writing good HTML document involves both technical issues and design issues. Technical issues included proper construction of the document while design issues ensures the information content is clearly presented to users.

HTML can be used to create web pages without any specialized software, in less time than it takes to schedule and wait for an appointment with a highly-paid HTML wizard. This language can be learned very fast by following example.

b) XML

Extensible Markup Language, abbreviated XML, describes a class of data objects called XML documents and partially describes the behavior of computer programs

which process them. XML is an application profile or restricted form of SGML, the Standard Generalized Markup Language [ISO 8879]. By construction, XML documents are conforming SGML documents.

XML documents are made up of storage units called entities, which contain either parsed or unparsed data. Parsed data is made up of characters, some of which form character data, and some of which form markup. Markup encodes a description of the document's storage layout and logical structure. XML provides a mechanism to impose constraints on the storage layout and logical structure.

A software module called an XML processor is used to read XML documents and provide access to their content and structure. It is assumed that an XML processor is doing its work on behalf of another module, called the application. This specification describes the required behavior of an XML processor in terms of how it must read XML data and the information it must provide to the application.

XML (Extensible Markup Language) is a flexible way to create common information formats and share both the format and the data on the World Wide Web, intranets, and elsewhere. For example, computer makers might agree on a standard or common way to describe the information about a computer product (processor speed, memory size, and so forth) and then describe the product information format with XML. Such a standard way of describing data would enable a user to send an intelligent agent (a program) to each computer maker's Web site, gather data, and then make a valid comparison. Any individual or group of individuals or companies that want to share information in a consistent way can use XML.

HTML, however, describes the content of a Web page (mainly text and graphic images) only in terms of how it is to be displayed and interacted with. XML describes the content in terms of what data is being described. For example, the word "phonenum" placed within markup tags could indicate that the data that followed was a phone number. This means that an XML file can be processed purely as data by a program or it can be stored with similar data on another computer or, like an HTML file, that it can be displayed

XML is "extensible" because, unlike HTML, the markup symbols are unlimited and self-defining. XML is actually a simpler and easier-to-use subset of the Standard Generalized Markup Language (SGML), the standard for how to create a document structure. It is expected that HTML and XML will be used together in many Web applications. XML markup, for example, may appear within an HTML page.

c) Visual Basic .NET

Microsoft Visual Basic® .NET is the newest, most productive version of the Visual Basic tool set that enables developers to address today's pressing application development issues effectively and efficiently. Visual Basic .NET enables the creation of rich applications for Microsoft Windows®, incorporate data access from a wider range of database scenarios, create components with minimal code, and build Web-based applications.

The following are the features provided by Visual Basic .NET:

i) Solve Problems More Effectively

Problems are solved in the following way:

- Build Robust Windows-based Applications

With new Windows Forms, developers using Visual Basic .NET can build Windows-based applications that leverage the rich user interface features available in the Windows operating system. All the rapid application development (RAD) tools that developers have come to expect from Microsoft are found in Visual Basic .NET, including drag-and-drop design and code behind forms. In addition, new features such as automatic control resizing eliminate the need for complex resize code. New controls such as the in-place menu editor deliver visual authoring of menus directly within the Windows Forms Designer. Combined with greater application responsiveness, as well as simplified localization and accessibility.

- Resolve Deployment and Versioning Issues Seamlessly

Visual Basic .NET, tackles issues with Component Object Model (COM) registration. Side-by-side versioning prevents the overwriting and corruption of existing components and applications. XCOPY deployment enables Windows-based applications to be deployed to client machines simply by copying files into the desired application directory. In addition, the auto-downloading of applications for Windows makes the deployment of rich Windows-based applications as easy as deploying a Web page.

- Create Web Applications with a Zero Learning Curve

Using the new Web Forms Designer in Visual Basic .NET, Visual Basic developers can apply the skills they have today to build true thin-client Web-based applications. Drag-and-drop Web Form creation delivers Visual Basic for

the Web while code behind forms enables developers to replace limited scripting capabilities of the past with the full power of the Visual Basic .NET language. New intelligent rendering capabilities and server-side Web Forms controls provide Web applications that render on any browser running on any platform. The new HTML designer delivers Microsoft IntelliSense® statement and tag completion for HTML documents. In addition, separation of HTML markup and code enable more efficient team-based development.

ii) Provides Flexible, Simple Data Access

Visual Basic .NET provides support for both the new Microsoft ADO.NET for flexible, highly scalable data access and ActiveX Data Objects (ADO) data binding for connection oriented data access. ADO.NET enables XML-based data binding to any database, as well as classes, collections, and arrays using disconnected data access and new classes including the DataSet and DataAdapter. Seamless access to ADO classes enables simple data access with familiar paradigms for connected data binding scenarios.

iii) Rapid Development

Visual Basic .NET supports full object-oriented constructs to enable more componentized, reusable code. Language features include full implementation inheritance, encapsulation, and polymorphism. Visual Basic .NET also empowers Visual Basic developers to consume XML Web services running on any platform and build Web services as easily as building any class in Visual Basic 6.0. Finally, Visual Basic .NET enables developers to tackle projects of any size. With new multithreaded applications, developers can build massively scalable server-side

components and Web applications, as well as more responsive client-side applications that perform multiple tasks in parallel.

In addition, Visual Basic .NET support built-in security, direct access to the Microsoft .NET Framework, and the capability to target an extensive array of mobile devices. The rich .NET Framework security model provides fine-grained control over application security while secure Windows Forms eliminate the need for ActiveX controls and ActiveX documents. With complete, direct access to the .NET Framework, developers can quickly access the registry, event log, performance counters, and file system, as well as eliminate the need for declares statements for accessing the operating system. And with the Microsoft Mobile Internet Toolkit, Visual Basic developers can build applications that render intelligently on more than 80 mobile devices.

iv) Easy Upgrades

Visual Basic .NET provides a smooth upgrade process for all Visual Basic developers, regardless of their existing code base, skills, or migration plan.

Using COM interoperability, it is possible to achieve seamless bi-directional communication between applications written in Visual Basic 6.0 and those written in Visual Basic .NET, without the need to rewrite. Visual Basic 6.0 and Visual Basic .NET, as well as the applications written in each version of the product, can reside seamlessly, side-by-side on the same machine. Full support for existing ADO code and data binding means that one can preserve data access experience in Visual Basic .NET.

To take full advantage of the new features in Visual Basic .NET and the .NET Framework, developers can upgrade their code using the Visual Basic .NET Upgrade Wizard, available in Visual Studio .NET Professional, Enterprise Developer, and Enterprise Architect editions. This wizard upgrades up to 95 percent of existing Visual Basic 6.0 code and forms to Visual Basic .NET.

So XML and VB .NET are chosen as the web programming language of this project.

4.2.5.1 Web Scripting Language

Scripting is the small-embedded program in the HTML code. A HTML page will be very dull without script in it. Scripting language is the type of script. Scripting language can be divided into two categories, which is server side scripting and client side scripting. Server side scripting language will be processed by the server while the client side scripting language will be processed on the browser and will not be send to the server. There are three popular scripting languages, which used in web programming. There are VB Script, Java Script and Jscript.

a) VB Script

VB Script is a subset of Visual Basic for Applications Programming Language. It brings active scripting to various environments, including web client scripting and web server scripting such as in Microsoft Internet Information Server. Like Java Script, VB Script code can be embedded in HTML documents.

It is easy to master and use, small, fast, secure and a lightweight interpreter language for use in web application development. It is fast because it does not have strict

types, through the support of various type, which involve extra work to interpreter like type checking. It is safe as it dose not have any functionality that can directly access the client's operating system or system life.

VB Script is flexible, as it can be used in a wide variety of applications and Microsoft is committed to ensuring that wherever script is part of an application, VB Script will be included. On the client side, that is the browser, VB Script interacts with ActiveX controls to provide active and interesting content. Whereas on the server site, it is used such as in Active Server Pages (ASP) and interpreted within HTML to provide a new level of functionalities an ease of use in web site development.

b) Java Script

Java Script is a general-purpose scripting language developed by Netscape Communications and Sun Microsystems, which has rapidly gained popularity among Internet developers. Java Script preceded the European Computer Manufactures Association (EMCA) standard and it was the first web scripting language created for dynamic interaction and content. It is closely related to Java, which is based on C++, except it is an interpreter language. Java Script was designed as a language that would appeal to the many programmers who use C, C++ and Java. This means that it "borrows" features from these languages where appropriate, but is a language in its own right and includes many features that not found in C, C++ or Java.

It is easy-to-use and designed for creating live online applications. It is analogous to VB Script. One advantage of Java Script is that modern browsers like Internet Explorer and Netscape Communicator provides support for this language, but Netscape does not support for VB Script. Base online applications and functions can be added to web pages with Java Script, but the number and complexity of available API functions are less than what is available with Java. Java Script code, which can be included in a web page along with the HTML code, is generally considered easier to write than the Java language itself.

So both the VBScript and Java Script are chosen as the web scripting language of this project.

4.2.6 Web Application Development Tools

Firstly, web application development tool is defined as a tool used to assist in the development of an application. Sometimes, the web application development tools that are considered is depending on the web language and technology that we have for the project. For this project, a few applications tools have been considered:

- Microsoft Visual Interdev 6.0
- Microsoft Visual Studio .NET

a) Microsoft Visual InterDev 6.0

Microsoft Visual InterDev comes as part of Microsoft suite of professional programming tools, known as Visual Studio. Visual InterDev is a tool developing dynamic web applications. It is a development environment and a collection of useful tools and utilities.

Visual InterDev is the tool that Microsoft promotes as their favored ASP editing tool. One simple but useful feature of Visual InterDev is that it highlights ASP <% and %> tags in yellow, and the ASP script itself is highlighted using blue for legal keyword. So they stand out from HTML.

There are three possible views of web pages:

- The Design View, is WYSIWYG interface. This allows users to put together a web page in much the same way as when creating a document in the Microsoft Word. Picture, links, sound can be inserted without having to write a single line of HTML.
- The Source View, the HTML generated by any works that have been done in the design view can be seen.
- The Quick View tab, to preview the HTML pages in advance.The Design and the Quick View are not able to process ASP. Both are limited to viewing HTML only. However, if the ASP file in the Source View contained within a project, there's an ASP-friendly alternative. We can select the View|View in Browse to see what the processed ASP will look like.

In addition, Visual InterDev boasts strong links with SQL server, which makes it very easy to setup database combining ASP and SQL Server. It also provides several useful web-based tools for doing things like checking links, highlighting the broken ones on your site and allowing us to drag and drop pages form one location to the another. Visual InterDev does not have a compile of drawbacks. It is the most difficult to master of the editors discussed here. But having said that, it's undoubtedly the most powerful of these editors as it offers many tools and features to the developer.

b) **Microsoft Visual Studio .NET**

Visual Studio .NET can be used to:

- Build the next-generation Internet.
- Create powerful applications fast and effectively.
- Span any platform or device.

Visual Studio .NET is the only development environment built from the ground up for XML Web services. By allowing applications to share data over the Internet, XML Web services enable developers to assemble applications from new and existing code, regardless of platform, programming language, or object model. Visual Studio .NET provides a rapid application integrated development environment for programming with the .NET Framework.

Visual Studio .NET provides developers with the team-based Web development tools required to rapidly design, build, and debug data-driven Web applications. All the tools need in building Web applications, mobile Web applications, or XML Web services, will have it in Visual Studio .NET.

The following are a few features of Visual Studio .NET:

i) Rapid End-to-End Application Development

- Build scalable Web applications by using ASP.NET with code-behind files. Move from slower, interpreted script to fast, compiled code by leveraging the full Microsoft Visual Basic® .NET, Microsoft Visual C#™ .NET or Microsoft JScript® .NET languages.
- Simplify Web development. Code files are separated from the HTML files to streamline team-based development.

- Use the integrated WYSIWYG page editor to visually construct sophisticated ASP.NET pages. Easily switch between the WYSIWYG design and HTML views while preserving source code formatting.
- Add document keywords to provide search terms that can be used by Internet search engines to identify the content of your page.
- Author cascading style sheets (CSS) visually with the CSS Builder to enable advanced layout in Web applications.
- Debug your code with efficient step-through debugging of client-side script, server-side code, and Microsoft SQL Server™ stored procedures at any point in your development cycle.
- Build applications that target most HTML 3.2 browsers, on any platform. Or, optimize for Microsoft Internet Explorer 5 or later or for Netscape Navigator 4.0 by using CSS and other powerful features supported by Internet Explorer.
- Increase coding speed with Microsoft IntelliSense®-enabled HTML and XML development. Tag completion is provided for Web development.

ii) Powerful, Integrated Database Tools

- Integrate your data. Visual Studio .NET works with SQL Server, Oracle, and most other major database systems.
- Design and modify database schemas visually and create stored procedures and other database objects for SQL Server and Oracle databases by using Visual Database Tools.
- Create and edit XML files visually with the XML Designer. Combine relational data and XML data in a Microsoft ADO.NET dataset.

- Create Web reports rapidly with Crystal Reports, which is included in Visual Studio .NET.

So Microsoft Visual Studio .NET is chosen.

4.2.7 Web Publishing

Microsoft SharePoint Portal Server

The overview below provides high-level, feature information on SharePoint Portal Server. This page touches on features associated with scalable enterprise search, integrated document management, and customized portal solution. The standard features of SharePoint Portal Server is shown below (Table 4.1).

Features	Description
Scalable, Enterprise Search	• Retrieve text using state of the art probabilistic ranking. The search engine also features "best bets," property searches, and auto-categorization of crawled content. • Crawl and search file and Web servers, Microsoft Exchange Server Public Folders, Lotus Notes servers, and remote servers for SharePoint Portal Server. • Classify content under a set of customer-defined categories. This allows easy navigation to information.
Integrated Document Management	• A complete set of document management functionality is accessible directly from the Microsoft Office 2000 toolbar and Microsoft Windows® Explorer. This helps users manage documents with familiar tools.

	• Enables optional enhanced Web folders so that documents can be reserved by individual users for updating. • Use the Discussions feature in Office and Hypertext Markup Language (HTML) documents for inline, content review.
Customized Portal Solution	• Get flexible, Web Part–based portals using digital dashboard layouts and content interfaces, using third party or your own Web Parts. • Develop solutions using familiar tools like Microsoft Visual Studio®. • Utilize common interfaces like Microsoft ActiveX® Data Objects (ADO), Extensible Markup Language (XML) and Hypertext Transfer Protocol (HTTP), and Web Distributed Authoring and Versioning (WebDAV).

Table 4.1: Features of SharePoint Portal Server

4.3 Summary: The Tools Chosen

The tools chosen to develop the company portal are as follows:

4.3.1 Development Platform

Window 2000 is the operating system chosen. Below are the reasons why it has been chosen over the other operating system.

- Dominant Position

  One of the main reasons for choosing this operating system is that Windows currently enjoys a dominant position as the preferred network operating

system by most corporations. In the consumer market, Microsoft's Windows enjoys a penetration rate of almost 90% of the overall market, which makes it almost the *de facto* choice for operating system.

- User Friendly Environment

  Windows 2000 server support multitasking and it is also extremely user-frienldly. Furthermore, the user interface of Windows 2000 server is very similar to Windows 95 or Windows 98. Therefore, users have no difficulty in adopting to Windows 2000 server. This is unlike Unix, where the tasks are performed by command scripts. New users have difficulty in learning these commands. Moreover, Window 2000 Server is a networking operating system that help developers build and deploy business application faster. New management tools in Windows 2000 include helps to set up web-site, simplify access to resources, manage contents and analyze usage patterns. These reduce the cost of building a server.

- Ease of Installation

  Installing Windows 2000 does not present much difficulty. However, UNIX involve complicated installation procedures. For example, each UNIX machine has their different documented installation procedure. Prior to each installations, the source code (kernel) needs to be compiled.

- Developments Tools

  Various development tools have been created for Windows users. Some of these have helped to speed up the software development process.

Furthermore, many applications tools adopting the visual programming method like Visual Interdev, Visual Basic, Front Page and so on. Visual programming is useful in cutting the time spent on the program coding.

- Skilled Professional

  Microsoft boasts of extensive resources of skilled professional as its produce are widely used. However, UNIX does not have as many skilled development and support professionals. This will inherently increase the cost of developing and maintaining the system as the shortage of professional leads to competition.

Windows 2000 server also supports for innovative web publishing features, customize tools and new wizard technologies makes it the best platform available to publish information over the Internet especially in this proposed system.

4.3.2 Web Server

The IIS 5.0 was chosen over the other web servers, the main reason is that the IIS 5.0 is tightly integrated with Windows 2000 Server, which is the platform used to develop this system. It is designed to deliver a wide range of Internet and Intranet server capabilities.

Due to the reason that ASP was chosen as the application development technology for implementing the proposed system, IIS 5.0 is the best choice as web server for this system. This is because it was obvious that IIS was chosen as ASP runs on the

IIS. Moreover, its comprehensive web server solution for instance, built in search engines encouraging the proposed system to use it as the most suitable web server.

The other benefit for using the Microsoft Internet Information Server 5.0 (IIS 5.0) are:

- Easiest Web Server to setup. Using the download wizard the developer can choose to install. Additionally, the new unattended installation capability enables installation of IIS on multiple servers without to monitor the installations.

- Innovative web publishing features, customizable tools, and new wizard technologies unique to IIS 5.0, make Windows 2000 Server with IIS the easiest way to publish information and share it securely over the Internet.

4.3.3 Database Management System

Due to the reason that the proposed is not an independent single desktop system, Microsoft SQL Server 2000 is the best choice as the web database for the development of this system if compare with Microsoft 2000 Access. Microsoft SQL Server 2000 incorporates a world-class feature set for distributed client/server computing.

Microsoft SQL Server 2000 is chosen over MS Access 2000. Although MS Access 2000 is easier relatively, it is considered a lower level database which is not suitable for the proposed system.

The SQL Server 2000 will see benefits in the following key areas:

- Reliable distributed data and transactions
- Centralized control of distributed servers
- Very high performance and scalability
- Support for very large databases
- Full programmability and standards support
- Rich desktop integration
- Open interoperability

4.3.4 Web Programming

ASP.NET is chosen as the web application programming technology over ASP because it is more suitable. ASP .NET provide the few features which ASP does not have such as:

- Enhanced Performance
- World-Class Tool Support
- Power and Flexibility
- Simplicity
- Manageability
- Scalability and Availability
- Customizability and Extensibility
- Security

4.3.5 Web Programming Language

XML remains the default for development web pages. Although HTML is easy-to-use, it is rather simple, static and does not support some dynamic features or effects that need to be included in the web pages. Due to this reason, XML is chosen as the web application language because XML is a flexible way to create common information formats and share both the format and the data on the World Wide Web, intranets, and elsewhere.

Visual Basic .NET is chosen as the main programming language because of the following features:

- Solve Problems More Effectively
- Provides Flexible, Simple Data Access
- Get on the Fast Track to Building Tomorrow's Applications Today
- Upgrade for Success

4.3.6 Web Application Development Tools

Due to the reason that ASP .NET is the chosen technology in web development for this project, Microsoft Visual Studio .NET is chosen over the others development tools. This is because Microsoft Visual Studio .NET is originally designed for developing the ASP .NET web pages. It is a development environment in which developer can create, edit, deploy, and manages ASP .NET. Visual Studio .NET combines a rich set of database connectivity tools, wizards, and design time controls.

4.4 The Software and Hardware Requirement

4.4.1 Development Requirement

a) Software Requirement

After a detail analysis and consideration on the several tools and software, Table 4.2 outlines the selected software for the development of the proposed system.

Component	Description
Development Platform	Windows 2000
Web Server	Microsoft Internet Information Server 5.0 (IIS 5.0)
Database Management System	Microsoft SQL Server 2000
Web Programming	Active Server Pages .NET(ASP .NET)
Web Programming Language	VB .NET, XML
Scripting Languange	VBScript, JavaScript
Web Development Tools	Microsoft Visual Studio .NET
Web Publishing	Microsoft SharePoint Portal Server

Table 4.2: The selected software for the development of the proposed system

b) Hardware Requirement

Table 4.3 and Table 4.4 outline the minimal hardware requirements for two types of machine; the computer used for system development and the server computer for hosting the system.

c) Server Computer

The specifications for the hardware used in developing Company Information Portal of Tenaga Nasional Berhad Generation, Prai.

Component	Descriptions

Microprocessor	Pentium IV
RAM	At least 256 MB
Storage	At least 550 MB available hard disk space
Input Devices	Mouse, keyboard, scanner
Output Devices	Printer
Video Monitor	EGA, VGA or compatible display

Table 4.3: Minimal Hardware Requirements for Server Computer

d) Development Computer

The ideal specifications for the hardware of the development computer are:

Component	Description
Microprocessor	Pentium II 200 MHz or above
RAM	At least 64 MB
Storage	At least 30 MB available hard disk space
Input Devices	Mouse, keyboard
Video Monitor	EGFA, VGA or compatible display
Internet Connection	At least ISDN line

Table 4.4 Minimal Hardware Requirements for Development Computer

4.5 Summary

In this chapter, the development methodology and system analysis of the proposed system have been described.

Before developing a system, it is very important to determine the requirement of the system. The deficient of the currently system, user capability and user expectations will be considered in determine the requirement of the proposed system. In order to identify the requirement for the proposed system, information gathering has been carried out. The information was gathered through data observation and informal interview.

The result of the information gathering will be used to determine the system requirements. System requirements will be categorized into two types, functional requirements and non-functional requirements. These requirements were described in this chapter. The explanation for the main modules and sub modules of this system were also included in this chapter.

Development of an efficient system involves the integration of software and hardware components. In this chapter, the considerations on several system development tools have been carried out. The selection of the most suitable tools for development process is a critical decision that has impact on the flexibility of design, resource requirement, ease of development and ability to integrate various resources. In the last part of this chapter, the hardware and software requirement for the proposed system have been described. The required hardware and software will be categorized into two types, server side and development side. The hardware and software requirements for runtime are also described in the last part of this chapter. It outlines the component that users have to prepare for surfing this proposed online directory system.

The next chapter will describe the system design. It will clearly identify and explain the various components of the proposed system such as architectural design, database design, functional design, user interface design and others.

Chapter 5

SYSTEM DESIGN

System design is the essential nucleus of the software engineering process and is applied regardless of the development standard that is used. The steps involved include analyzing, designing, coding and testing the system to ensure that it conforms to the software specifications. Each activity transforms information in a matter that ultimately results in validated computer software (Pressman, 1997).

Designing a system refers to a set of identified components and inter-components that satisfies a specified set of requirement. There are many ways to create good system designs. Te choice is mainly based on designer preferences and experiences. However, every system design involves some kind of decomposition. It is a process that starts at the high-level depiction of the system's key elements and then creating lower level representations on how the system's features and functions will fit together.

The requirements for system are regarding to the analysis that had been discussed in the previous chapter. System design includes the following issues:

- System Architecture Design
- System Functionality Design
- User Interface Design

- Database Design

5.1 System Architecture Design

The implemented system architecture can affect all aspects of software design and engineering of a development project. Any inappropriate or flawed architectural design could result in increase of development cost, poor response time, intricate future flexibility and thorny maintenance of the application (Gallaugher, 1995).

The Company Information Portal architecture is developed based on the client/server approach. The client/server architecture is defined as a computational architecture that involves client processes requesting service from server processed (http://www.faqs.org). Servers are powerful computers or processes dedicated to managing disk drives (file servers), printers (print servers) or network traffic (network servers). Clients are personal computers or workstations on which users run applications. Clients rely on servers for resources, such as files, devices and even processing power.

5.1.1 The Three-tier Client/Server Architecture

The conceptual architecture of the three-tier application applies when we split an application across three tiers are split into three logical components of the application: user interface, computational logic and data storage (Figure 5.1). In reality, the three-tier Web applications generally consist of:

a) The first tier is the Client. The Internet browser provides the user interface to obtain inputs from users and to display outputs as well.

b) The middle tier runs on a server and is often called the Application Server. This is where the functional modules actually process the data.

c) The third tier runs on a second layer server called the Database Server. A database management system (DBMS) resides in the server and stores the data required by the middle tier.

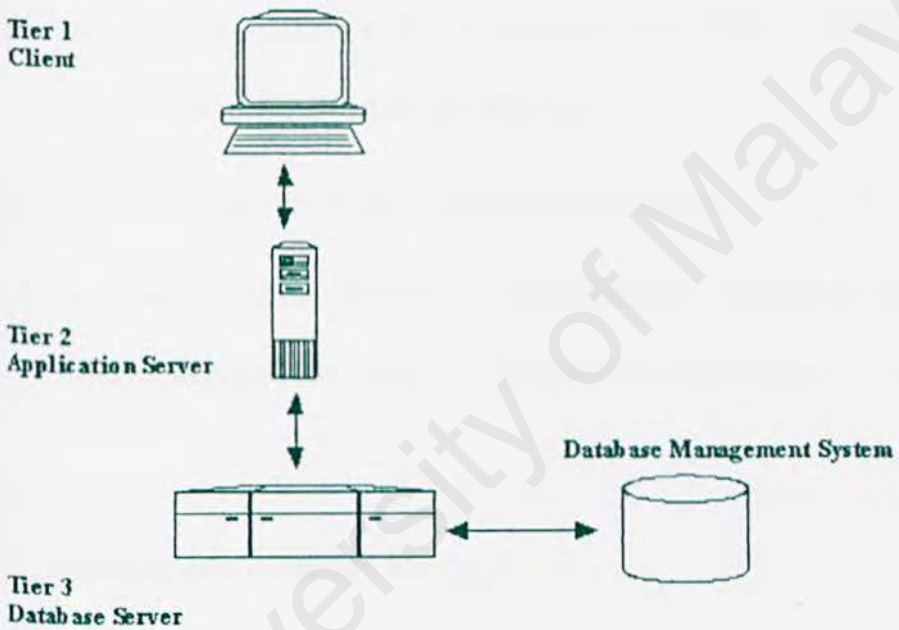

Figure 5.1: 3-Tier Architecture of Company Information Portal

5.1.2 Advantages of Three-tier Client/Server Architecture

Two-tier architecture is where a client talks directly to a server, with no intervening server. This is typically used in small environments with less than 50 concurrent users. The approach of prototyping an application in two-tier environment and then

scaling it up by simply adding more users to the servers will usually result in an effective system. In order to avoid the servers from being overwhelmed and to properly scale to hundreds or thousands of users, the three-tier architecture needs to be implemented.

The three-tier architecture has many advantages over traditional two-tier or single-tier designs. The main advantages are as follows:

a) The added modularity makes it easier to modify over traditional two-tier or single-tier without affecting the other tiers.

b) Increases performance and securities for large number of users

c) Improves openness, flexibility, maintainability, reusability and scalability while hiding the complexity or distributed processing from the user.

5.2 System Functionality Design

System functionality design is based on the system requirements as stated in previous chapter. The design translated the system requirements into system functionality. The functional design phase focuses on the system structure design and data flow diagram.

5.2.1 System Structure Chart

A structure chart is a type of tree diagram. Main modules of the Company Information Portal are depicted as labeled ovals in the structure chart. These modules are factored into more detailed sub-modules using top-down approach. The

objective of system structure chart is to show how the modules in Company Information Portal are related to each other. Figure 5.1 below showed the structure chart of Company Information Portal.

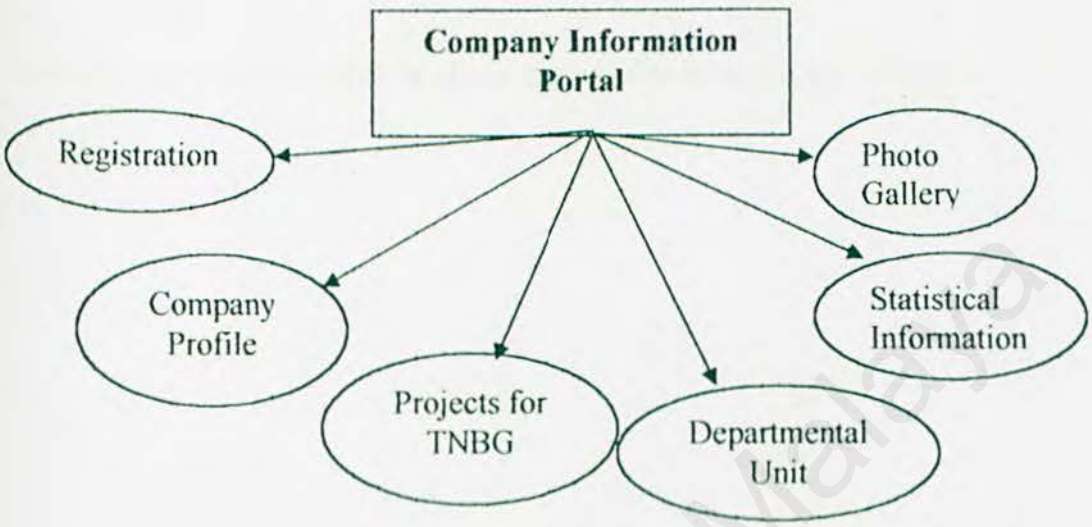

Figure 5.2: Structure Chart for Company Information Portal

Company Information Portal consists of five major parts, which are the Company Profile, Projects for TNBG, Departmental Unit, Statistical Information and Photo Gallery. Basically, the Company Profile is to show all the history of TNBG such as company background, mission and vision for the three of the TNBG station in Prai, Gelugor and Teluk Ewa. On the other hand, the Projects for TNBG is to let the user got to know more information about the projects which is going on in every station from time to time.

For the Departmental Unit, each section available will be displayed. This will ensure that the user will be more familiar with the section in the TNBG. For the Statistical Information, information such as the statistical survey on the annual company

growth, installed capacity of the previous years, availability and efficiency percentage for the previous years will be displayed too. Finally, the Photo Gallery will allow user to view the photo available such as environment, turbine and boiler.

The summary of the description above can be seen in the Figure 5.3 below.

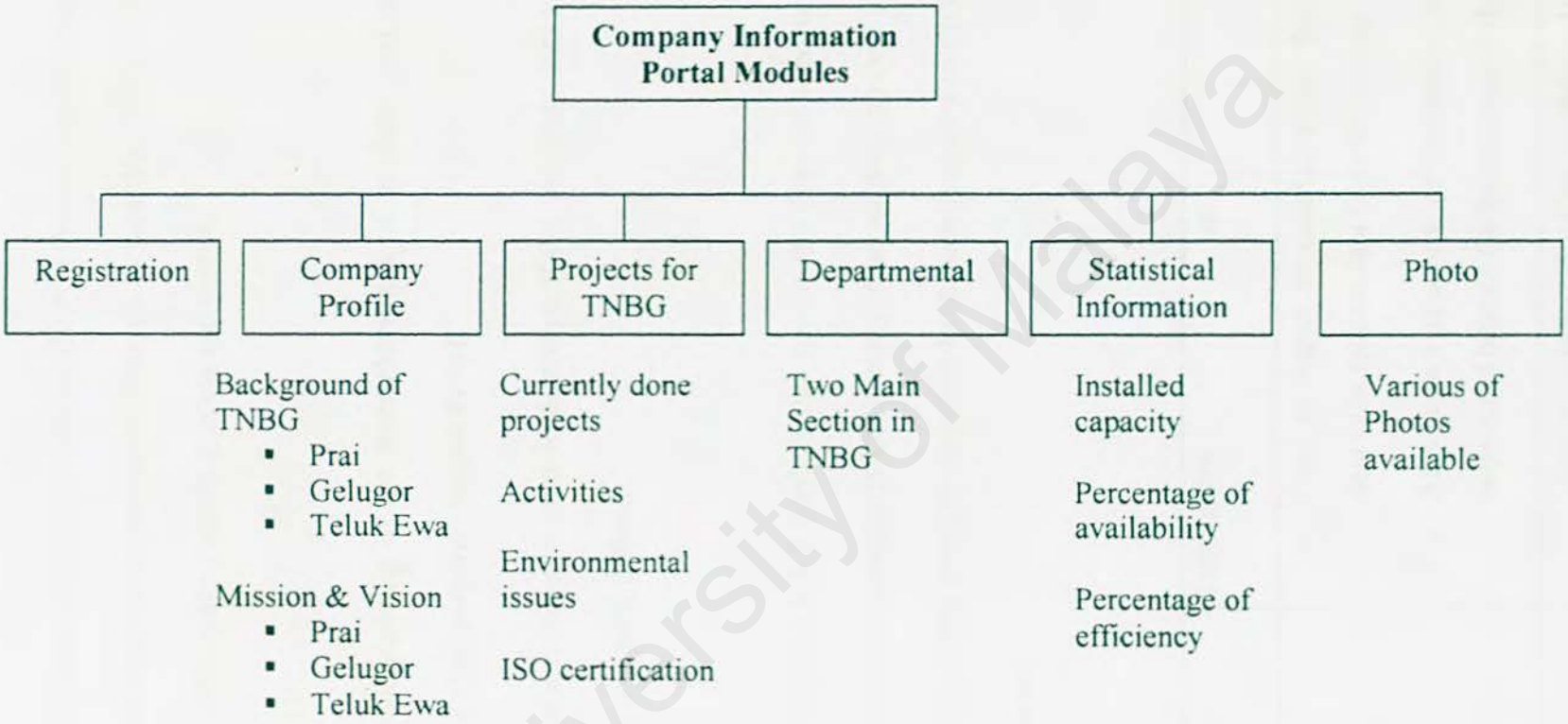

Figure 5.3: The Structure Chart of the Company Information Portal

5.2.2 Data Flow Diagram (DFD)

Data Flow Diagram (DFD) is a graphical representation of a system that illustrates the data flow through interconnected processes (Kendall & Kendall, 1999). DFD will depict the overview of the system inputs, process and outputs.

The advantages of using DFD are:

- Further understanding of the interrelatedness of modules and sub modules of Company Information Portal.
- Analysis of a proposed system to determine if the necessary data and processes have been defined.

DFD is easy to be understood as it has symbols that specify the physical aspects of implementation. There four basic symbols in DFD: entity, flow of data, process and data stores (see Table 5.1). Three types of diagrams have been prepared to utilize and explain the DFD approach.

Symbols	Attribute	Description
	Entity	• Used to depict an external entity that can send data to or receive data from the system. • Also known as source or destination of data and considered beyond the boundaries of the system.
	Flow of Data	• Used to represent the flow of data or information from one point to another. • Arrow describes the directions of the flow, with the arrowhead pointing to the data's destination.

		• Each data flow is labeled with the details of the data.
	Process	• Used to show occurrences of a transforming process. Processes always denote a change in data within the system. • The symbol consist of two sections: 1. The top section is the unique identifier indicating its level. 2. The lower section contains the description of the process.
	Data Store	• Used to represent data store and holds data for a given time within the system. • The symbol consists of two sections: 1. Identifier reference number 2. Description of the data stored

Table 5.1: DFD Symbols and Descriptions

The data flow is conceptualized with a top-down perspective. So, the Context Level Diagram will be drawn, followed by the Diagram 0. Diagram 0 is an overview process of all the major modules in Company Information Portal that includes all the data stores, entities and process involved.

a) Context Diagram

A Context Diagram is a straightforward representation of the entire system in a very common state. It is an overview that includes basic inputs, the general system and

the outputs (Figure 5.4). It consists of a single process that is numbered '0' and does not include any data stores.

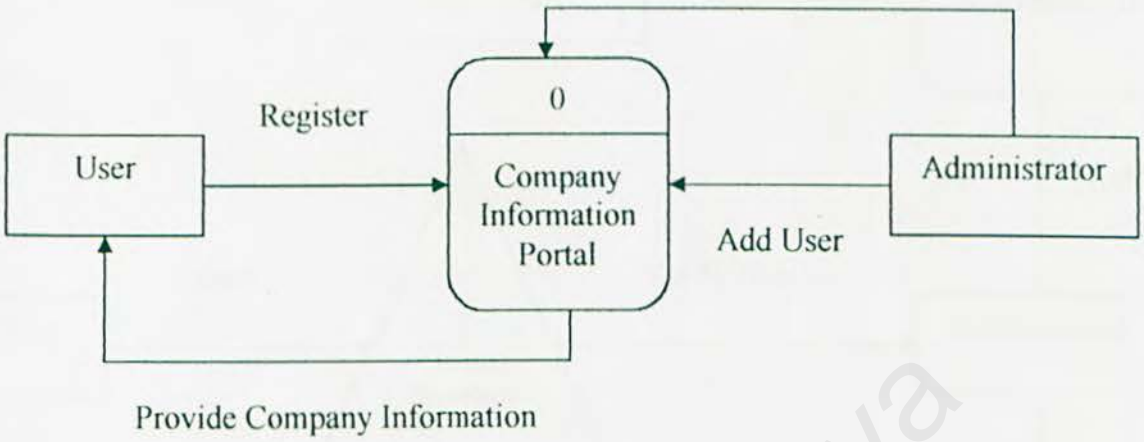

Figure 5.4: The Context Diagram of the Proposed Company Information Portal

b) Diagram 0

Diagram 0 is the detailed description or explosion of the context diagram. It shows all the major processes, data movement and data stores at the highest level of detail. Figure 5.5 illustrates the Diagram 0 of the proposed Company Information Portal.

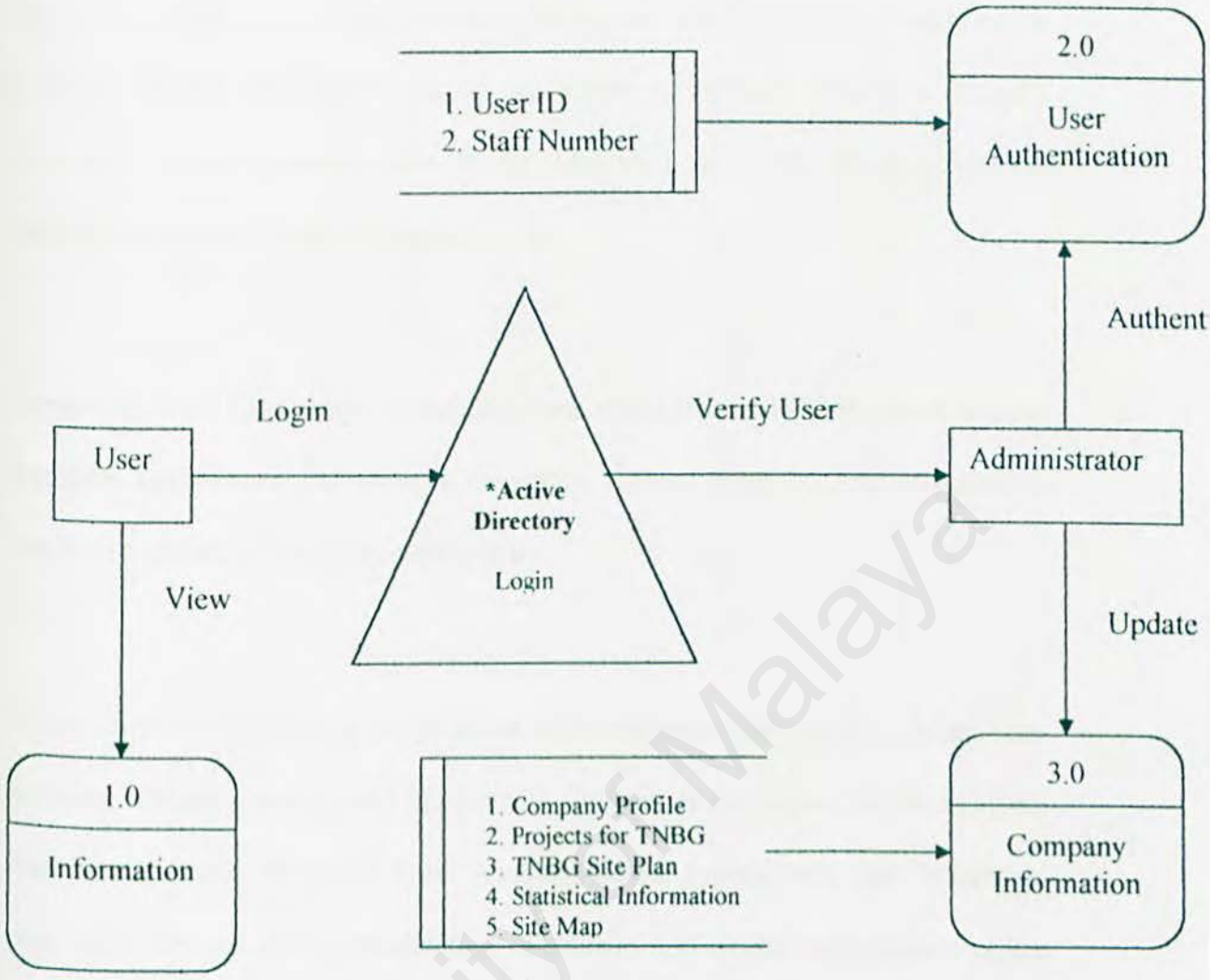

Figure 5.5: The Diagram 0 of the Proposed Company Information Portal

*** Refer the Figure 5.6 for further explanation on Active Directory**

Active Directory

Active Directory is an essential and inseparable part of the Windows 2000 network architecture that improves on the domain architecture of the Windows NT® 4.0 operating system to provide a directory service designed for distributed networking environments. Active Directory lets organizations efficiently share and manage information about network resources and users. In addition, Active Directory acts as

the central authority for network security, letting the operating system readily verify a user's identity and control his or her access to network resources. Equally important, Active Directory acts as an integration point for bringing systems together and consolidating management tasks.

Combined, these capabilities let organizations apply standardized business rules to distribute applications and network resources, without requiring administrators to maintain a variety of specialized directories.

Active Directory provides a single point of management for Windows-based user accounts, clients, servers, and applications. It also helps organizations integrate systems not using Windows with Windows-based applications, and Windows-compatible devices, thus consolidating directories and easing management of the entire network operating system. Companies can also use Active Directory to extend systems securely to the Internet. Active Directory thus increases the value of an organization's existing network investments and lowers the overall costs of computing by making the Windows network operating system more manageable, secure, and interoperable.

Active Directory lets organizations store information in a hierarchical, object-oriented fashion, and provides multi-master replication to support distributed network environments.

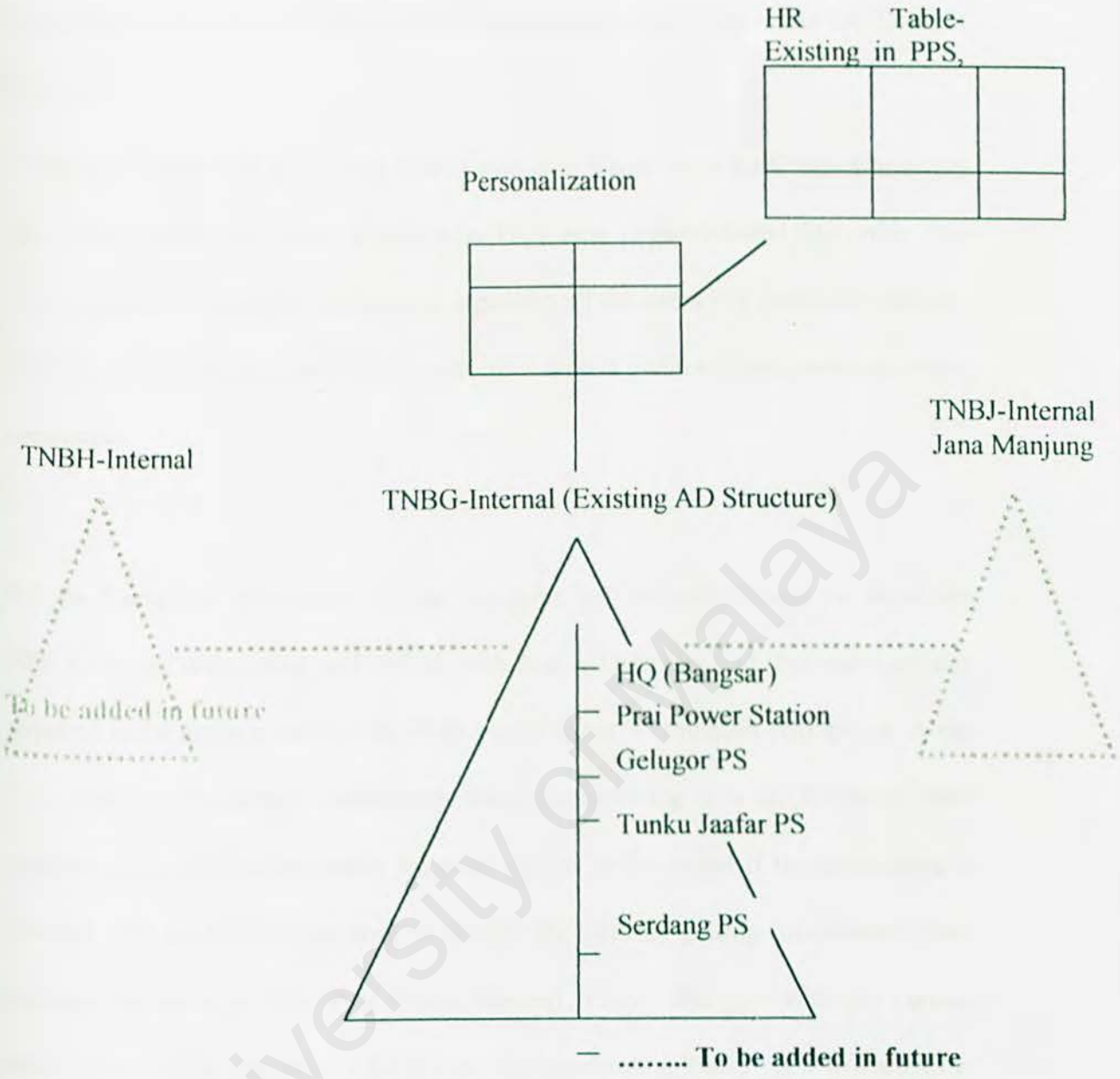

Figure 5.6: Active Directory Domain

The diagram above depicts the relationship between the Active Directory domains for TNBG in Penisular Malaysia. The main domain for the proposed project is the TNBG-Internal domain.

The power stations currently joining this domain are the Headquarters (Bangsar), Prai Power Station, Gelugor Power Station, Tunku Jaafar Power Station (Port

Dickson), Serdang Power Station. Others power stations will be joining this Domain in future.

TNBH and TNBJ will be joining TNBG Forest in future since both subsidiaries are also listed under Generation Division in TNB new Organizational Structure. The Active Directory contains information regarding all the users in a particular domain. User ID and password is provided to each user who is given authentication to access the system.

For the Company Information Portal, the users will be authenticate by Windows 2000 Domain, Web Portal will be link with Active Directory and thus users are not required to be authenticate by the Web Portal again. Permission will be set in the Web Portal for the authenticated users. When the users log in to the Windows 2000 platform, they will automatically be given access to the portal if the permission is allowed. The system will be able to identify the user by getting information from existing HR table in PPS (Prai Power Station), TNBG that join with the current login User ID. The join table is known as "Personalization Table" as it will store the preferences and profile for the login user.

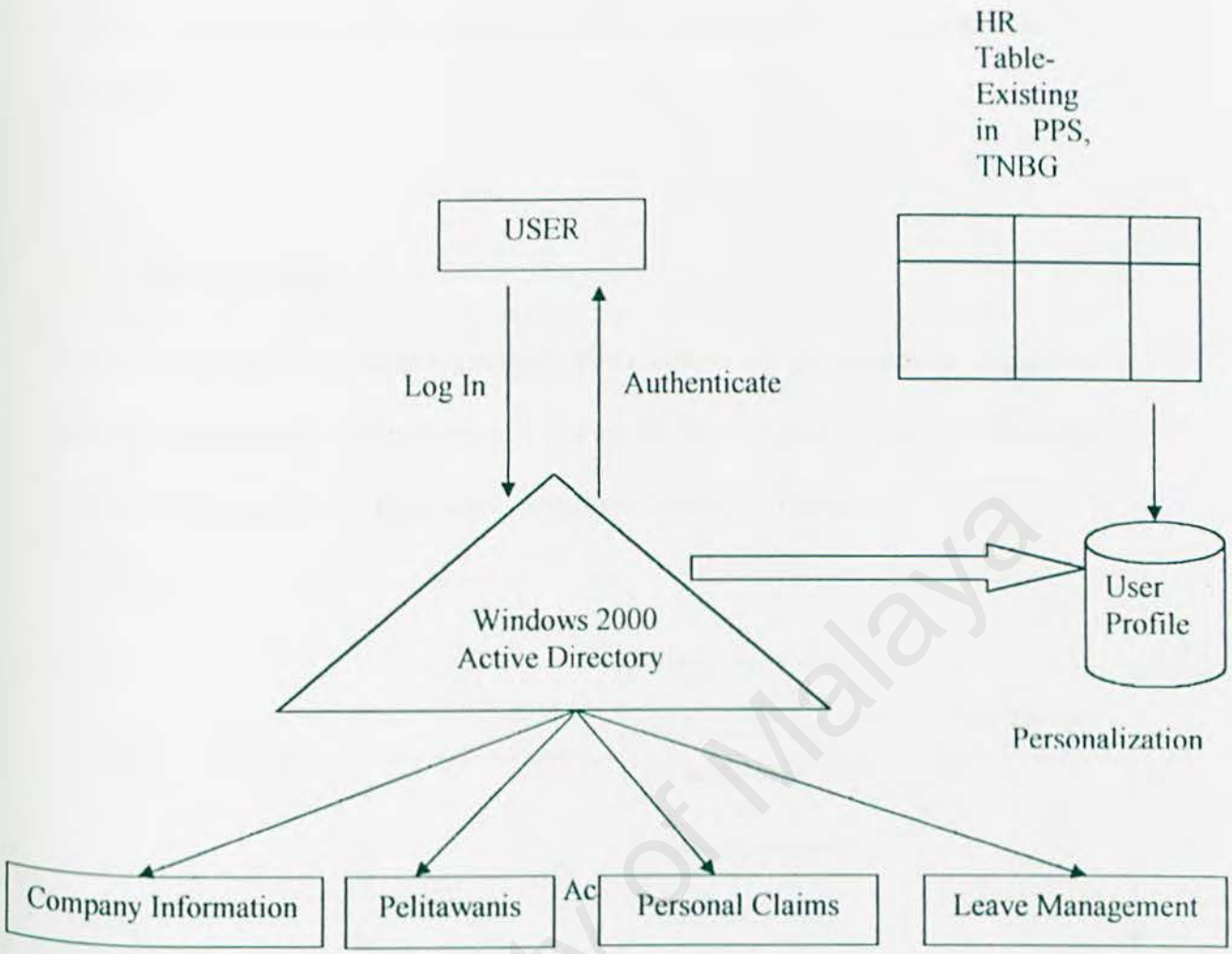

Figure 5.7: User Account Mapping

When a user logs into the Windows 2000 platform, the user will be authenticated using information form the Active Directory. If the user is a valid user, the system will be able to compare the current login id with the Personalization Table and thus the current user profile will be determined. Other details of the user can be retrieved from the HR table that already exists in TNBG.

The user will then be able to access the various portals and systems available, such as the Company Information Portal, Pelitawanis, Personal Claims and Leave Management System. Simply put, this means that the users only need to log in once

and they are able to access various systems automatically if the permission is allowed.

c) Child Diagram

A Child Diagram is a further detailed representation of sub-processes originated from the higher level of processes in Diagram 0. Figure 5.8 to Figure 5.9 illustrate the Child Diagram for the proposed Company Information Portal.

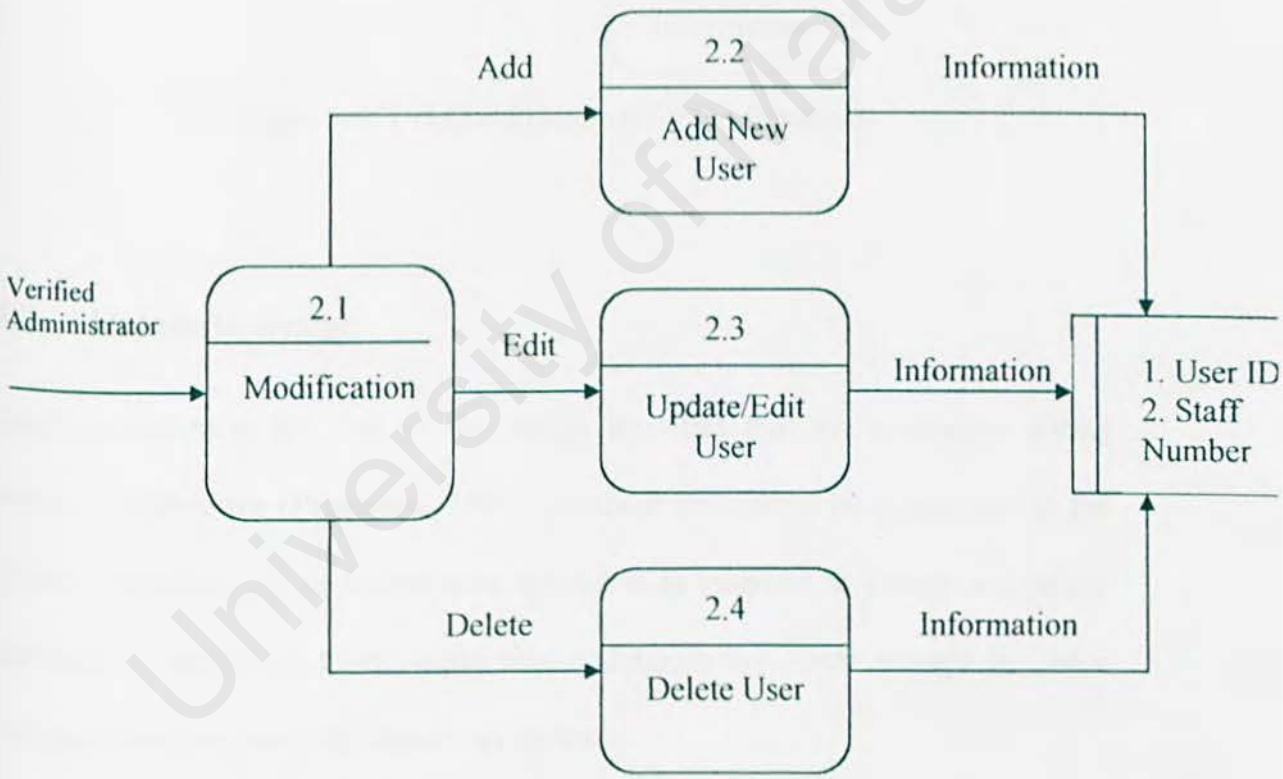

Figure 5.8: The Child Diagram for the Process 2

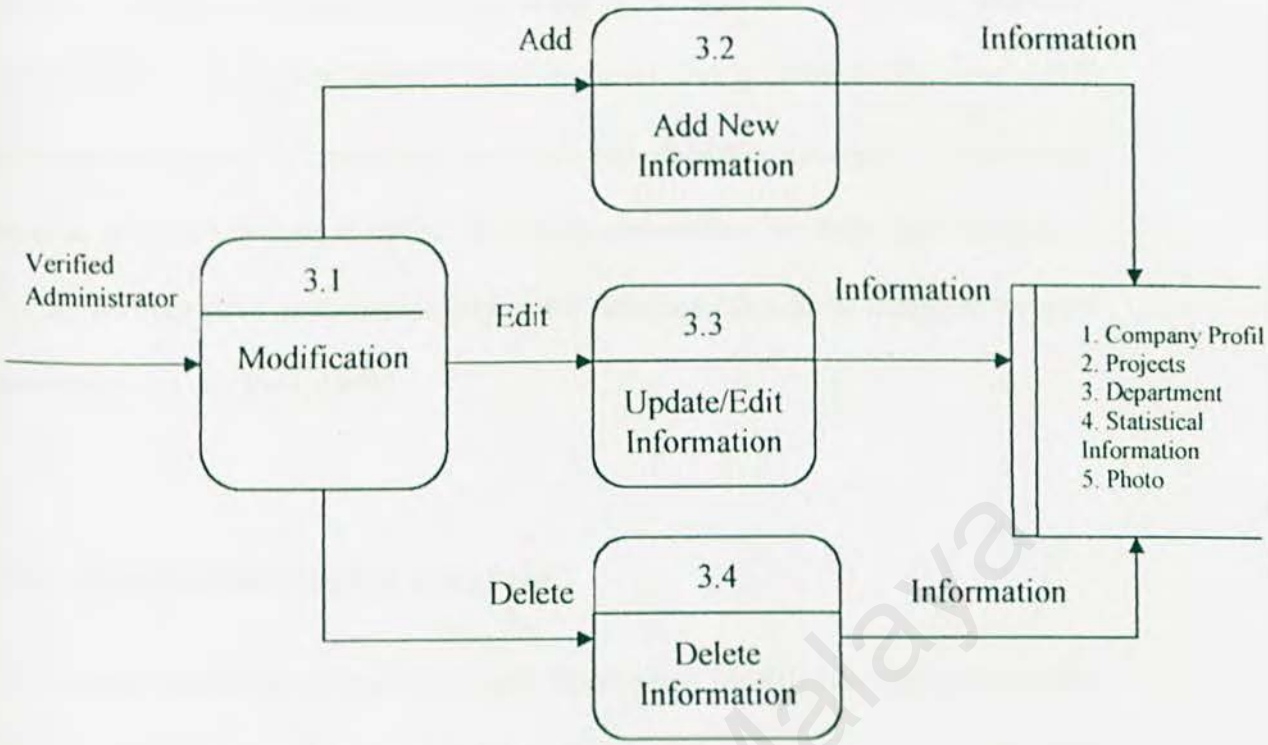

Figure 5.9: The Child Diagram for the Process 3

5.3 Database Design

Database design is the first of the design activities that are conducted during software engineering (**Pressman, 1997**). Database has always been regarded as the crucial component of an information system. It is essential to design a database carefully to ensure its functionality and maintainability. Data storage has been designed based on some key aspects as follows:

a) Data availability as to ensure data is available to user when is needed

b) Data integrity as to ensure the data is accurate and consistent

c) Efficient data storage

d) Purposeful data retrieval as to information retrieved must be in useful form to assist users

Database Management System (DBMS) is the most important part of any database. It allows the data creation, modification, retrieval and generation of reports. The implemented DBMS is based on the relational database approach. A relational database stores all its data in tables. All operations on data are done on the tables or produce another table as the result. Relational databases should be designed through data normalization (**Post, 1999**).

5.3.1 Entity-Relationship Diagram

In 1976, the use of the entity-relationship model (E-R Model) has been introduced. An E-R diagram contains many entities, many different types of relations, and numerous attributes.

The benefits of Entity Relationship modeling are mentioned below:

i. Databases need to be designed and entity relationship (ER) modeling is an aid to design.

ii. An ER model is a graphical representation of the system and is a high-level conceptual data model.

iii. Supports a user's perception of data and is independent of the particular DBMS and hardware platform.

There are only two types of relationship used in the proposed Company Information Portal, which are one-to-one and one-to-many relationships. The entity-relationship diagram can be seen as below (Figure 5.10).

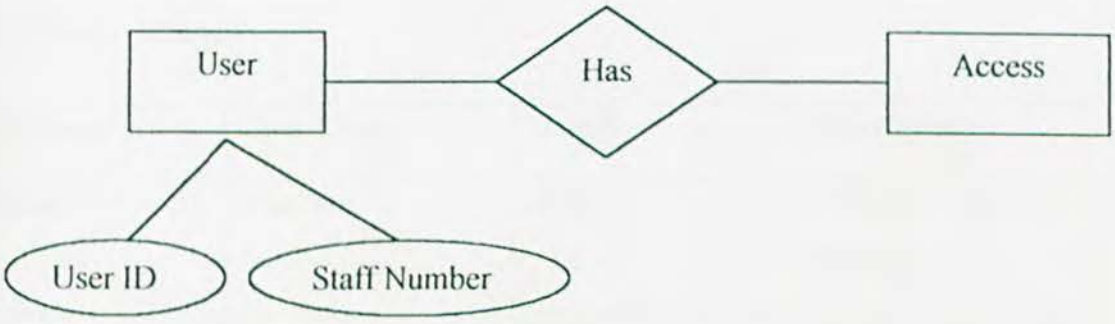

Figure 5.10: The Entity-Relationship Diagram of Company Information Portal

5.3.2 Data Dictionary

Data dictionary is a reference work of data about data or metadata that is compiled to guide the reader through the database analysis and design. The data dictionary is a set of system tables that holds the definitions of all the data tables and describes the type of data that is being stored (**Post, 1999**). It typically lists all of the tables, column, data domains and assumptions within the database. The database of the proposed Company Information Portal consists of few tables as shown in figure below.

Table Name: **Staff**

Field Name	Data Type	Length	Description
stf_staffId	Varchar	100	The identifier of a user
Stf_password	Varchar	50	Password of a user

Table 5.2: The Staff Table Definition

Table Name: **Mission**

Field Name	Data Type	Length	Description
Mission	Varchar	8000	Mission of the company
Vision	Varchar	8000	Vision of the company

Table 5.3: The Mission Table Definition

Table Name: **Location**

Field Name	Data Type	Length	Description
Location1	Varchar	8000	Location paragraph 1
Location2	Varchar	8000	Location paragraph 2
Location3	Varchar	8000	Location paragraph 3
Location4	Varchar	8000	Location paragraph 4

Table 5.4: The Location Table Definition

Table Name: **History**

Field Name	Data Type	Length	Description
History1	Varchar	8000	History paragraph 1
History2	Varchar	8000	History paragraph 2
History3	Varchar	8000	History paragraph 3
History4	Varchar	8000	History paragraph 4

Table 5.5: The History Table Definition

Table Name: **Configuration**

Field Name	Data Type	Length	Description
configuration1	Varchar	8000	configuration paragraph 1
configuration2	Varchar	8000	configuration paragraph 2
configuration3	Varchar	8000	configuration paragraph 3
configuration4	Varchar	8000	configuration paragraph 4

Table 5.6: The Configuration Table Definition

Table Name: **Arrangement**

Field Name	Data Type	Length	Description
arrangement1	Varchar	8000	arrangement paragraph 1
arrangement 2	Varchar	8000	arrangement paragraph 2
arrangement 3	Varchar	8000	arrangement paragraph 3
arrangement 4	Varchar	8000	arrangement paragraph 4

Table 5.7: The Arrangement Table Definition

5.4 User Interface Design

User interface is defined as methods and devices that are used to accommodate interaction between machines and the users (http://cfg.cit.cornell.edu). The two fundamental tasks of user interfaces are to communicate information from the machine to the user and to communicate information from the user back to the machine.

The overall process for designing of a user interface begins with the creation of different models of system function (as perceived form the outside) (Pressman, 1997). The user interface design is based on the Graphical User Interface (GUI). Some of the Human-Computer Interface (HCI) general principles of designing an interactive system have been considered and applied.

There are two major factors that lead for chosen GUI approach. The factors are:

a) The use of graphics to communicate information to the users visually in addition to textually is much more effective.

b) GUI will present a finite number of options to the users rather than requiring the users to memorize or manually enter commands from a virtually unlimited set of options.

The HCI general principles are listed in Table 5.8 as below.

Principles	Description
Consistency	Consistent format for command input, data display, button selection and placing

	of the control objects.
Confirmation and Verification Message	Asks for verification of any non-trivial destructive action such as deleting document.
Recoverability	Ability of the user to take corrective action once an error has been recognized.
Forgive Mistake	The system should protect itself from user error that might cause it to fail.
Reverse Action	Allows user to return to the previous state (before change).
Functions Grouping	Categorizes activities by function and organize screen geography accordingly.
Simple Command Name	Use short and meaningful command. Concise name is easy to memorize and reduce typing mistake.
Responsiveness	How the user perceives the rate of communication with the system. For example, the mouse pointer changes to hourglass or displays a wait message when the system is processing data.
Context Sensitive Help	Provides relevant help topic for current state.

Table 5.8: HCI General Principles

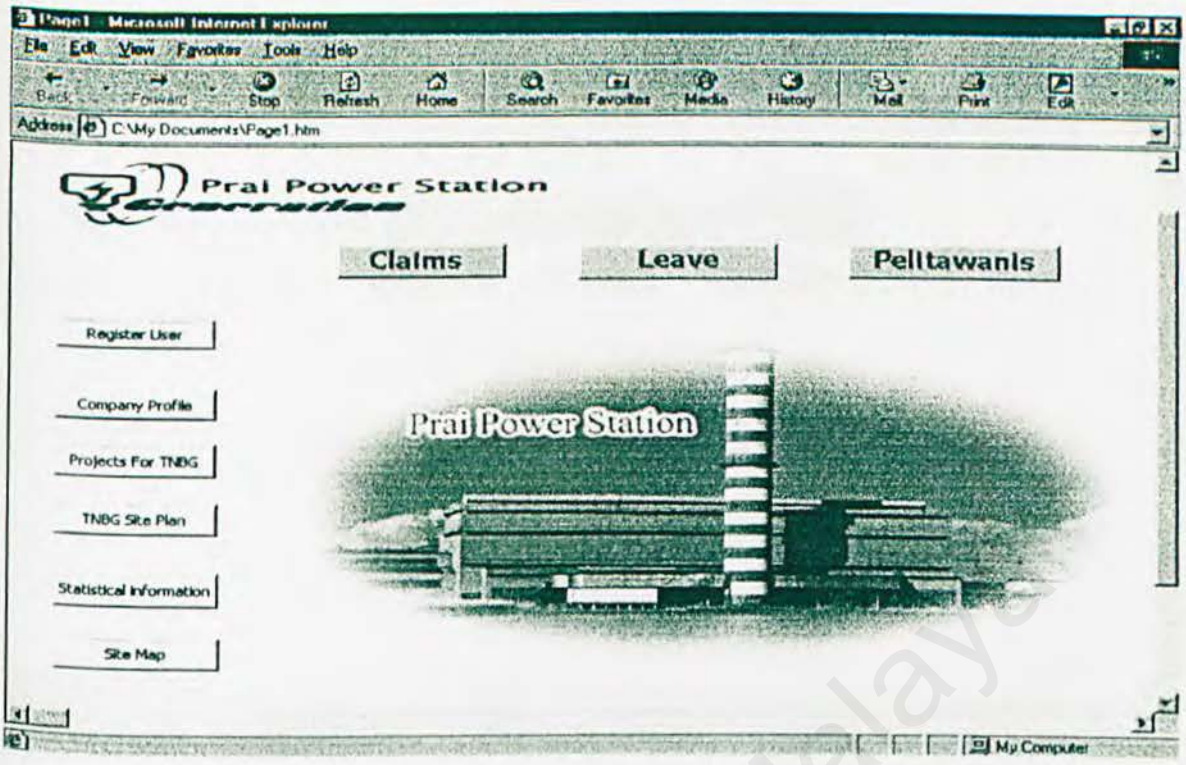

Figure 5.11: User Interface for Main Page

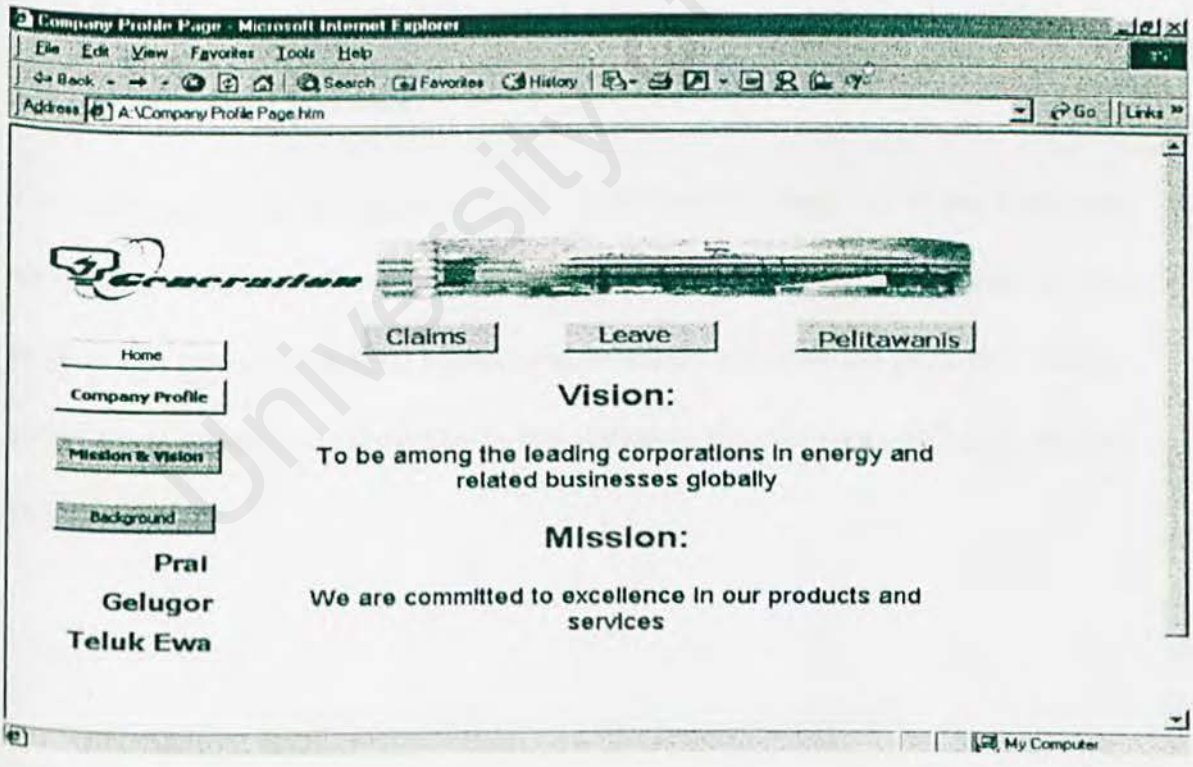

Figure 5.12: User Interface for Company Profile

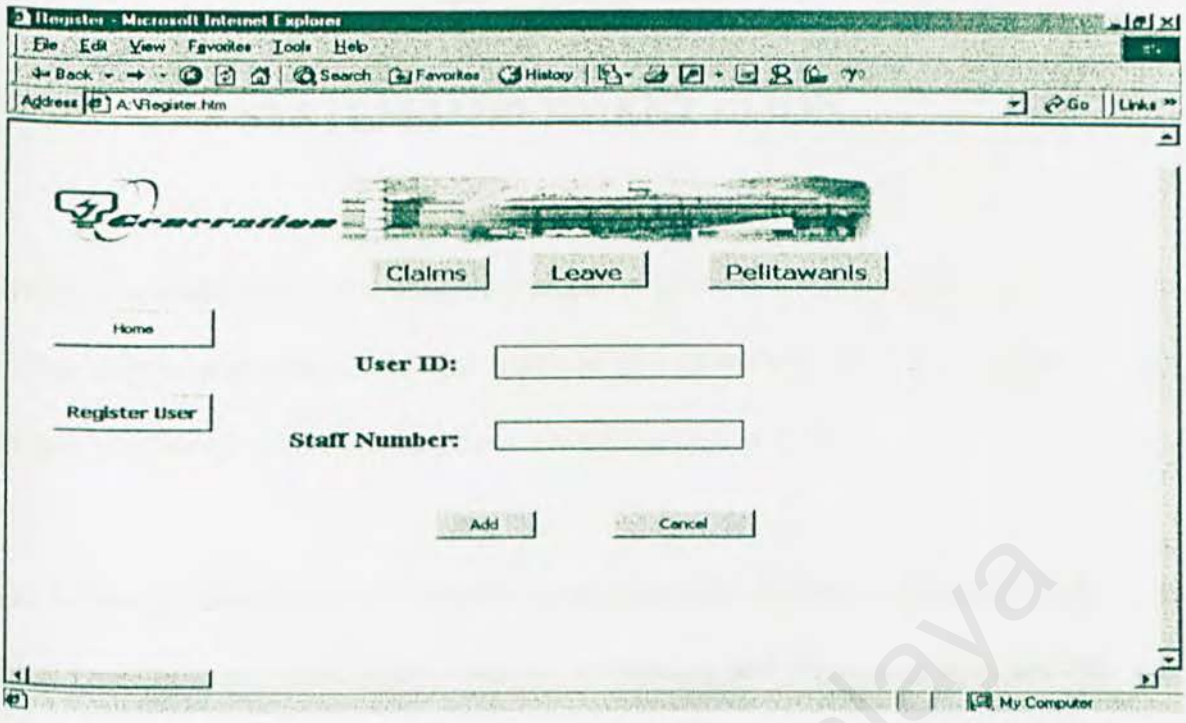

Figure 5.13: User Interface for Register

5.5 Expected Outcome

The main target was to realize the goals of the project could fulfill the respective objectives. Company Information Portal for TNBG, Prai is the end product of this project. The project is focused to meet the necessary needs of the users in TNBG to gather more information about the power station in the shorter period and simplest way.

Chapter 6

SYSTEM IMPLEMENTATION

System implementation is the material realization phase of the system development. The conceptual and technical designs from the system analysis phase are interpreted as well as modeled to become the physical working system itself.

The following subchapters will explain the development environment as well as the development of the system itself, some system coding and the coding style applied in the Company Information Portal. The physical development environment is divided into two parts, the hardware and software components. The system coding is described according to modules. A sample of coding from each module is also included for system coding reference. The final subchapter highlights some of the good programming practicces applied throughout the Company Information Portal system development

6.1 Development Environment

Development environment has a momentous influence on the development of a system. System development can be paced up significantly by utilizing the approtiate hardware and software. The following sections discuss the hardware and software tools used to developed and document Company Information Portal.

6.1.1 Hardware in the Development Environment

The hardware configured for the development environment is the underlying element of the whole system. The hardware used in the system implementation phase plays an important role in realizing the final system architecture.

The hardware configuration of the development environment is listed as follows:

(a) IBM PIII

(b) Intel Pentium III 733 MHz microprocessor

(c) Memory – 500 MB 100 MHz SDRAM

(d) Monitor - 15" Color Multimedia Monitor

(e) Storage – 12.0 GB

(f) Media Bay – 1.44 MB Floppy Diskette drive, 52X CD-ROM drive

(g) Two Buttons Mouse

6.1.2 Software in the Development Environment

Hardware and software form a tightly coupled cohesion that operates in unison to perform programmed tasks. Without software, the fastest, biggest or the most powerful computer will also be inoperative and idling in the corner. The software tools utilized in the development environment as listed in the following table (Table 6.1).

Description	**Software**
Operating System	Microsoft Windows 2000 Server with Service Pack 3

Web server	Microsoft Internet Information Service 5.0
Database Management System	Microsoft SQL Server 2000
Web Development Tool	Microsoft FrontPage 2000, Macromedia Dreamweaver MX
Coding Languages	1) Hypertext Markup Languange (HTML), Cascaded Style Sheet (CSS) 2) Active Server Page (ASP), Visual Basic Scripts (VB Scripts), JavaScripts
Graphic Creation	Adobe Photoshop 7.0, Macromedia Flash MX
Web Browser	Microsoft Internet Explorer 6.0
Documentation	Microsoft Word XP

Table 6.1: Summary of the Software in Development Environment

6.2 Development of the System

6.2.3 Database Development

The system database is created in Microsoft SQL Server 2000, which is the Database Management System (DBMS). Many of the administrative tasks performed with SQL Server are accomplished using the Enterprise Manager. This tool is used to create the system database and all of the associated objects such as tables, views, diagrams and others. Maintenance tasks, which consist of database backups and restorations, are also performed using the Enterprise Manager.

The Enterprise Manager tool is used to create the system database named Company. Then creating a table that needed by specifying all the fields for each table and the field's property.

Figure 6.1 displays the Company database in Enterprise Manager.

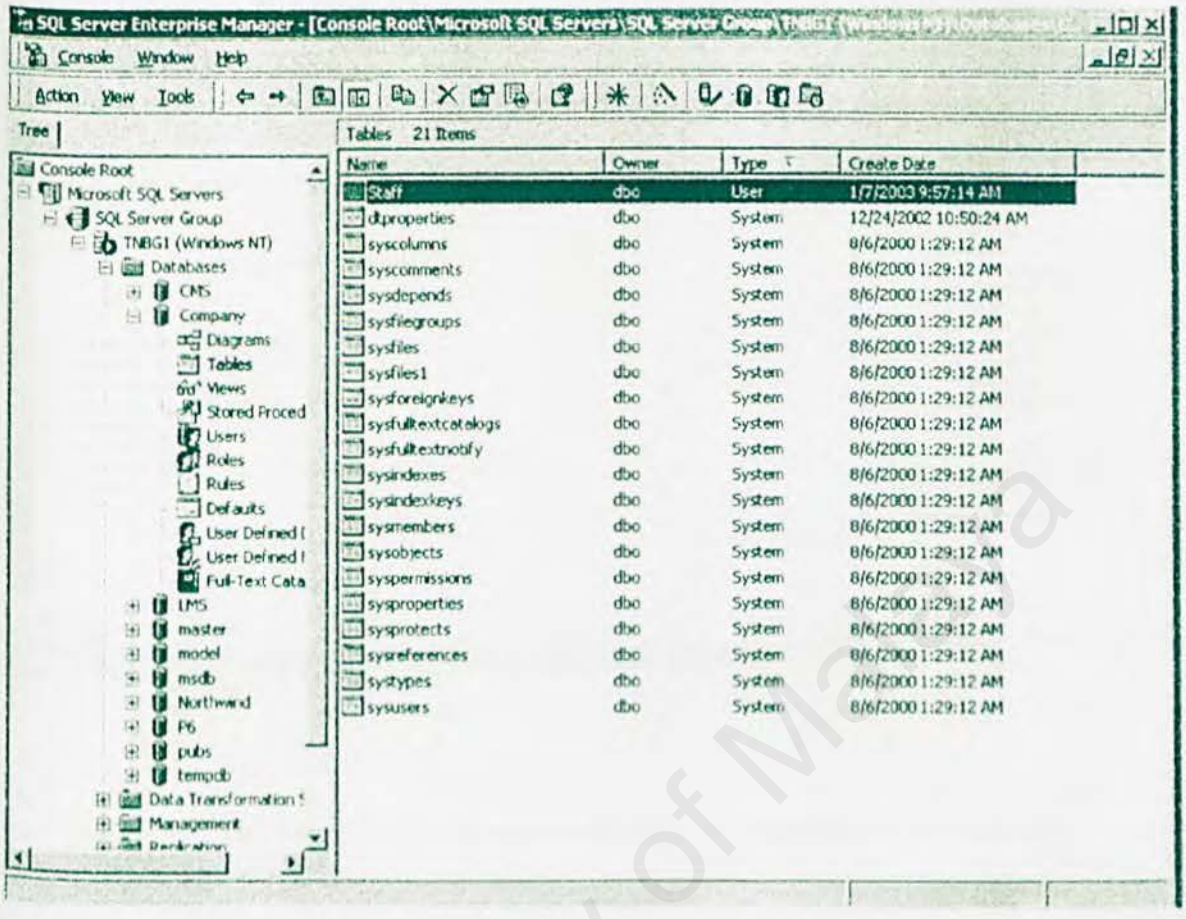

Figure 6.1: The Database Tables Displayed in Enterprise Manager

6.2.2 Prototype Development

The prototype development is basically the construction of the system utilizing the necessary means to achieve the proposed specification. The Company Information Portal is mainly consist of Active Server Pages (ASP). The language of ASP is written using the tools of Macromedia Dreamweaver MX. It has now reached version 6.0 and it has also become the established way to build dynamic Web pages. Figure 6.2 depicts the Source View of the Macromedia Dreamweaver MX.

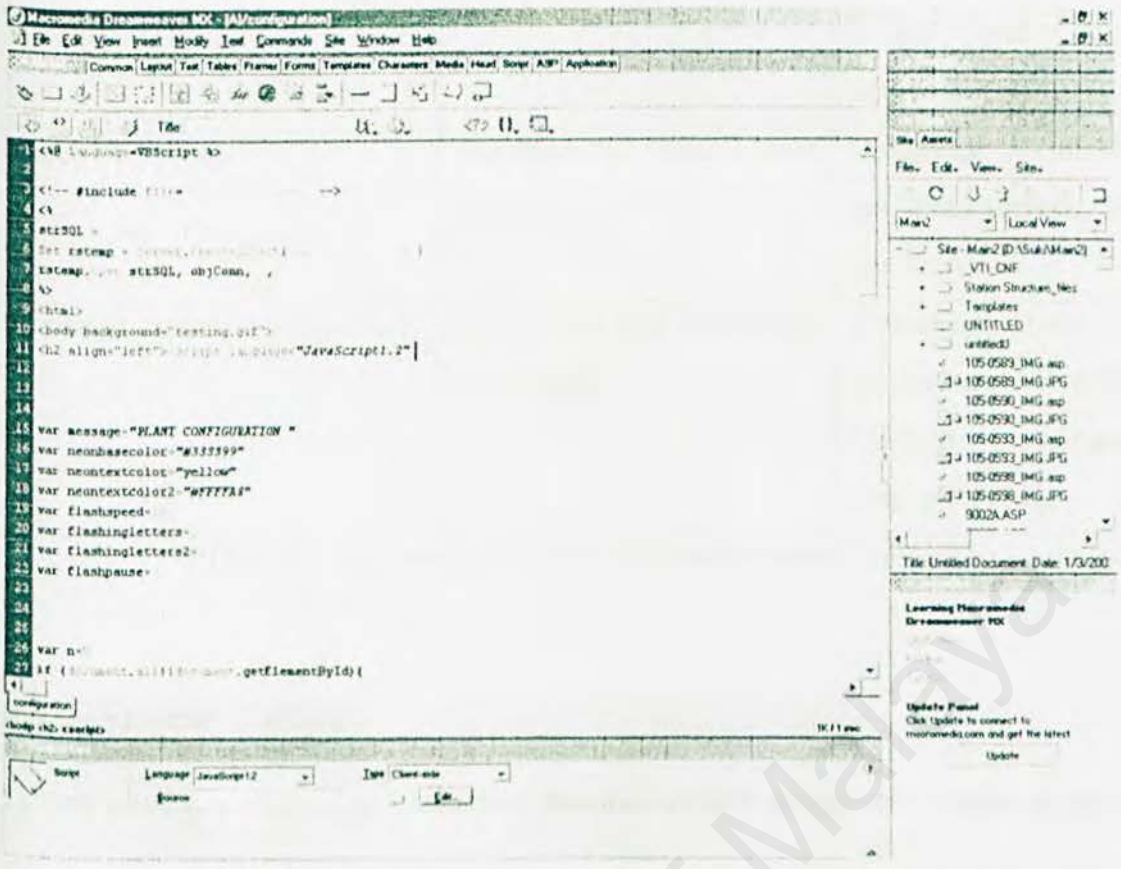

Figure 6.2: The Macromedia Dreamweaver MX Development Environment

Table 6.2 summarizes the software tools used during the development of the Company Information Portal system prototype.

Software	**Usage**	**Description**
Microsoft Windows 2000 Server	System Development Environment Platform	Operating System
Microsoft Share Point Portal Server	Document Management	Document Management Tools
Macromedia Dreamweaver MX	System Development	Prototype module coding and interface designs
Microsoft FrontPage 2000	System Development	Prototype cascaded style sheet coding
Microsoft Internet Information	Web Server Platform	Executing server side

System 5.0 (IIS 5.0)		scripts and Active Server Pages
Adobe Photoshop 7.0	Interface and Visualization Designs	Designing interface graphical images, logo ang icons
Microsoft Internet Explorer 6.0	Previewing and Evaluating Prototype	Executing client side scripts and Hypertext Markup Language coding (HTML)

Table 6.2: Summary of Prototype Development Tools

6.3 System Coding

System coding is referred as converting the prior system design into a working and functional system. This mainly comprises software programming and preliminary testing of the prototype model. Programming is the process of transforming the structure charts, logical and physical data flow diagrams as well as interface desings into working prototype model. During transformation, both processing and testing should occur in parrallel (Jessup & Valacich, 1999). The testing performed in this phase is the developmental testing. The programmer is the person responsible of carrying out this preliminary testing that focuses on the correctness of individual modules.

6.3.1 Company Profile Module Coding

Table 6.3 lists the files created for the Company Profile Module.

Location.asp	History_list.asp
History.asp	History_edit.asp
Orgchart.asp	History_update.asp
Main.asp	Image:

Mission.asp	New_bg.gif
Map.asp	Map.jpg
Loginadm.asp	Prai.jpg
Chkadm.asp	Orgchart.jpg
Upload.asp	Bullet2.jpg
Uploadfile.asp	
Uploadform.asp	

Table 6.3: The List of Files Created for Company Profile Module

Figure 6.3 depicts sample coding for the company profile module.

```
<%@ Language=VBScript %>
<%Option Explicit%>
<!-- #include file="upload.asp" -->
<%

' Create the FileUploader
Dim Uploader, File, dte
Set Uploader = New FileUploader

' This starts the upload process
Uploader.Upload()

'****************************************
' Use [FileUploader object].Form to access
' additional form variables submitted with
' the file upload(s). (used below)
'****************************************
Response.Write "<b>File uploaded, these are the descriptions. " &
Uploader.Form("fullname") & "</b><br>"

' Check if any files were uploaded
If Uploader.Files.Count = 0 Then
        Response.Write "File(s) not uploaded."
Else
```

```
        ' Loop through the uploaded files
        For Each File In Uploader.Files.Items

                ' Check where the user wants to save the file
                If Uploader.Form("saveto") = "disk" Then

                        ' Save the file
                        File.SaveToDisk "C:/Inetpub/wwwroot/Company/Main2"

                End If

                ' Output the file details to the browser
                dte = date()
                Response.Write "File Uploaded: " & File.FileName & "<br>"
                Response.Write "Size: " & File.FileSize & " bytes<br>"
                Response.Write "Type: " & File.ContentType & "<br>"
                Response.Write "Date: " & dte & "<br><br>"
        Next
End If

%>
```

Figure 6.3: The Coding for Uploadfile.asp in the Company profile Module

6.3.2 Projects Module

Table 6.4 lists the files created for Projects Module.

configuration.asp	Image:
arrangement.asp	dumphw1.jpg
Conversion.asp	dumphw2.jpg
development.asp	ISO-9002A_small.jpg
Iso.asp	ISO-9002B_small.jpg
Langkawi.asp	ISO-9002C_small.jpg
Cert.asp	ISO-9002D_small.jpg
Iso_14001.asp	ISO-9002E_small.jpg

Iso_certificate.asp	ISO-9002F_small.jpg
configuration_list.asp	ISO-9002G_small.jpg
configuration_edit.asp	ISO-9002H_small.jpg
configuration_update.asp	ISO-9002K_small.jpg
arrangement_list.asp	certificateISO9002.jpg
arrangement_edit.asp	turbine.jpg
arrangement_update.asp	admin.jpg
development_list.asp	admin1.jpg
development_edit.asp	bullet1.jpg
development_update.asp	

Table 6.4: The List of Files Created for the Projects Module

Figure 6.4 depicts a sample coding for Projects Module.

```
<%@ Language=VBScript %>

<!-- #include file="connection1.asp" -->
<%
strSQL = "SELECT * FROM Configuration"
Set rstemp = Server.CreateObject("ADODB.Recordset")
rstemp.Open strSQL, objConn, 3,1
%>
<html>
<body background="testing.gif">
<h2 align="left"><script language="JavaScript1.2">

//Neon Lights Text II

var message="PLANT CONFIGURATION "
var neonbasecolor="#333399"
var neontextcolor="yellow"
var neontextcolor2="#FFFFA8"
var flashspeed=100                                    // speed of flashing in
milliseconds
var flashingletters=3                                 // number of letters
```

```
flashing in neontextcolor
var flashingletters2=1                                    // number of letters
flashing in neontextcolor2 (0 to disable)
var flashpause=0                                          // the pause between
flash-cycles in milliseconds

///No need to edit below this line/////

var n=0
if (document.all||document.getElementById){
document.write('<font color="'+neonbasecolor+'">')
for (m=0;m<message.length;m++)
document.write('<span id="neonlight'+m+'">'+message.charAt(m)+'</span>')
document.write('</font>')
}
else
document.write(message)

function crossref(number){
var crossobj=document.all? eval("document.all.neonlight"+number)
document.getElementById("neonlight"+number)
return crossobj
}

function neon(){

//Change all letters to base color
if (n==0){
for (m=0;m<message.length;m++)
crossref(m).style.color=neonbasecolor
}

//cycle through and change individual letters to neon color
crossref(n).style.color=neontextcolor

if (n>flashingletters-1) crossref(n-flashingletters).style.color=neontextcolor2
```

```
if (n>(flashingletters+flashingletters2)-1) crossref(n-flashingletters-
flashingletters2).style.color=neonbasecolor



if (n<message.length-1)
n++
else{
n=0
clearInterval(flashing)
setTimeout("beginneon()",flashpause)
return
}
}

function beginneon(){
if (document.all||document.getElementById)
flashing=setInterval("neon()",flashspeed)
}
beginneon()

</script></h2>
 <tr>
  <td valign="top">
   <p align="center"> </p>
   <p><font face="Verdana, Arial, Helvetica, sans-serif"><font size="-
1"><%=rstemp.Fields("configuration1")%></font></font> </p>
   <p><font face="Verdana, Arial, Helvetica, sans-serif"><font size="-
1"><%=rstemp.Fields("configuration2")%></font></font> </p>
        <p align="center"><font size="-1" face="Verdana, Arial, Helvetica, sans-
serif"><img src="admin.jpg" width="179" height="73">
   <img src="admin1.gif" width="179" height="73"> </font></p>
<p><font face="Verdana, Arial, Helvetica, sans-serif"><font size="-
1"><%=rstemp.Fields("configuration3")%></font></font> </p>
   <p><font face="Verdana, Arial, Helvetica, sans-serif"><font size="-
1"><%=rstemp.Fields("configuration4")%></font></font> </p>
   <p><font face="Verdana, Arial, Helvetica, sans-serif"><font size="-
```

```
1"><%=rstemp.Fields("configuration5")%></font></font> </p>
    <font size="-1" face="Verdana, Arial, Helvetica, sans-serif"><strong>Major
 Plant</strong></font>
        <p><font size="-1" face="Verdana, Arial, Helvetica, sans-serif"><img
src="bullet2.jpg" width="13" height="15">
  Steam Turbines</font></p>

        <p><font face="Verdana, Arial, Helvetica, sans-serif"><font size="-
1"><%=rstemp.Fields("configuration6")%></font></font> </p>
    <p><font size="-1" face="Verdana, Arial, Helvetica, sans-serif"><img
src="bullet2.jpg" width="13" height="15">
 Boiler</font></p>
<p><font face="Verdana, Arial, Helvetica, sans-serif"><font size="-
1"><%=rstemp.Fields("configuration7")%></font></font> </p>
        <p align="center"><font size="-1" face="Verdana, Arial, Helvetica, sans-
serif"><img src="turbine.jpg" width="223" height="100"></font></p>

 </tr>
</body>
</html>
```

Figure 6.4: The Coding for configuration.asp in the Projects Module

6.3.3 Statistical Module

Table 6.5 lists the files created for Statistical Module.

Formula.asp	Button:
Statistic.asp	Bullet1.jpg

Table 6.5: The List of Files Created for the Statistical Module

Figure 6.5 depicts a sample coding for Statistical Module.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
<head>
<title>Untitled Document</title>
```

```
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
</head>

<body background="testing.gif">
<div align="center">
<p><strong>Installed Capacity</strong></p>
 <br>

<table width="69%" border="1">
 <tr>
  <td width="26%">Installed Capacity</td>
  <td width="14%"> </td>
  <td width="60%">Tested Annual Available Capacity (TAAC) (2002)</td>
 </tr>
 <tr>
  <td>Prai   Unit 4 </td>
  <td>120 MW </td>
  <td>101 MW</td>
 </tr>
 <tr>
  <td>        
         Unit 5</td>
  <td>120 MW</td>
  <td>102 MW</td>
 </tr>
 <tr>
  <td>        
         Unit 6 </td>
  <td> </td>
  <td>105 MW</td>
 </tr>
 <tr>
  <td>Gelugor      GT1</td>
  <td>110 MW</td>
  <td>107 MW</td>
 </tr>
```

```
 <tr>
  <td>        GT2</td>
  <td>110 MW</td>
  <td>97 MW</td>
 </tr>
 <tr>
  <td>Telok Ewa GT1 </td>
  <td>34 MW</td>
  <td>27 MW </td>
 </tr>
 <tr>
  <td>        GT2</td>
  <td>34 MW</td>
  <td>32 MW</td>
 </tr>
</table>
<p> </p>
<p><strong>Availability </strong></p>
<table width="74%" border="1">
 <tr>
  <td width="18%"> </td>
  <td width="8%">U4</td>
  <td width="8%">U5</td>
  <td width="7%">U6</td>
  <td width="13%">Glg GT1</td>
  <td width="13%">Glg GT2</td>
  <td width="15%">TE GT1</td>
  <td width="18%">TE GT2</td>
 </tr>
 <tr>
  <td>1999/2000</td>
  <td> </td>
  <td> </td>
  <td> </td>
  <td> </td>
 </tr>
```

```
  <tr>
   <td>2000/2001</td>
   <td> </td>
   <td> </td>
   <td> </td>
   <td> </td>
  </tr>
  <tr>
   <td>2001/2002</td>
   <td> </td>
   <td> </td>
   <td> </td>
   <td> </td>
  </tr>
</table>
<p> </p>
<p><strong>Efficiency</strong></p>
<table width="75%" border="1">
 <tr>
  <td> </td>
  <td>U4</td>
  <td>U5</td>
  <td>U6</td>
  <td>Glg GT1</td>
  <td>Glg GT2</td>
  <td>TE GT1</td>
  <td>TE GT2 </td>
 </tr>
 <tr>
  <td>1999/2000</td>
  <td> </td>
  <td> </td>
  <td> </td>
  <td> </td>
 </tr>
 <tr>
```

```
  <td>2000/2001</td>
  <td> </td>
  <td> </td>
  <td> </td>
 </tr>
 <tr>
  <td>2001/2002</td>
  <td> </td>
  <td> </td>
 </tr>
</table>
</div>
<p><br>
 <br>
</p>
<p></p>
<p></p>
</body>
</html>
```

Figure 6.5: The Coding for statistic.asp in the Statistical Module

6.3.4 Departmental Module

Table 6.6 lists the files created for the Departmental Module.

Instrument.asp	teleperm.jpg
Electric.asp	Button:
Image:	button1.gif
Orgchart_inst.jpg	bullet1.jpg
MOTOR7.jpg	

Table 6.6: The List of Files Created for the Departmental Module

Figure 6.6 depicts a sample coding for Departmental Module.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
```

```
<html>
<head>
<title>Untitled Document</title>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
</head>

<body background="Image/TESTING.GIF">
<h2 align="left"><script language="JavaScript1.2">

//Neon Lights Text II

var message="ELECTRICAL MAINTENANCE SECTION"
var neonbasecolor="#333399"
var neontextcolor="yellow"
var neontextcolor2="#FFFFA8"
var flashspeed=100                                    // speed of flashing in
milliseconds
var flashingletters=3                                 // number of letters
flashing in neontextcolor
var flashingletters2=1                                // number of letters
flashing in neontextcolor2 (0 to disable)
var flashpause=0                                      // the pause between
flash-cycles in milliseconds

///No need to edit below this line/////

var n=0
if (document.all||document.getElementById){
document.write('<font color="'+neonbasecolor+'">')
for (m=0;m<message.length;m++)
document.write('<span id="neonlight'+m+'">'+message.charAt(m)+'</span>')
document.write('</font>')
}
else
document.write(message)
```

```
function crossref(number){
var crossobj=document.all? eval("document.all.neonlight"+number) :
document.getElementById("neonlight"+number)
return crossobj
}

function neon(){

//Change all letters to base color
if (n==0){
for (m=0;m<message.length;m++)
crossref(m).style.color=neonbasecolor
}

//cycle through and change individual letters to neon color
crossref(n).style.color=neontextcolor

if (n>flashingletters-1) crossref(n-flashingletters).style.color=neontextcolor2
if (n>(flashingletters+flashingletters2)-1) crossref(n-flashingletters-
flashingletters2).style.color=neonbasecolor


if (n<message.length-1)
n++
else{
n=0
clearInterval(flashing)
setTimeout("beginneon()",flashpause)
return
}
}

function beginneon(){
if (document.all||document.getElementById)
flashing=setInterval("neon()",flashspeed)
}
```

```
beginneon()
</script></h2>

<p>Electrical Maintenance Section consist of 5 team members headed by Senior Electrical
 Engineer, En. Muhammad Kamal went to TeluElectrical Maintenance Section consist
 of 5 team members headed by Senior Electrical Engineer, En. Muhammad Kamal went
 to Teluk Ewa Power Station , Langkawi to carry out maintenance works from 14
 to 24 Febuary 2000 during Combustion Inspection GT1.<br>
<br>
The other team members are Mohd Dhazari, Zahari Md Noor, Shamsul Amri and
 Rajasingam. Among the works that have been carried out:-</p>
<p>
 ·125VDC Battery Inspection and testing<br>
 · Transformer testing, cleaning and painting<br>
 · 415V and 110VDC Motor testing <br>
 · ACB Testing and Inspection<br>
 · AC &amp;amp; DC lighting maintenance<br>
 · Generator Protection relay Calibration(carried out by TNB Trans. Networks)<br>
 · Generator testing.</p>
<center>
  <p><img src="MOTOR7.jpg" width="260" height="126"><br>
  During Inspection motor and testing</p>

 <p align="left"> <strong><font color="#3333FF" size="+1">QCS-IT
Team</font></strong>
 </p>
</center>
<p>&amp;quot;Impian&amp;quot; is the QCS-IT team from Electrical Maintenance Section.
 The Facilitator for the team is Muhammad Kamal Abu Bakar,the Group Leader is
 Mohd Dhazari Din and the rest of the team members are Mohd Sufhar Salamun, Zahari
 Md Noor, Shamsul Amri Mohd Piah, Mohd Khair Shood, M Jayaram and Chong Tian
 Hock. The team has finished their project &amp;quot;Masa yang lama menambah air
 demin bateri &amp;quot; and they have achieved many awards. </p>

<p></p>
During the QCS-IT Convention at the station level , the team achieved first place
```

```
award. Subsequently the team become the champion at TNB Generation Convention
in &amp;quot; Invosi &amp;quot; category. The team received the three star Gold Medal
award at the TNB QCS-IT Convention. At &amp;quot; Konvensyen QCC Peringkat Wilayah
Timur anjuran NPC&amp;quot; on 5/6 August 2000 at MS Garden Hotel , Kuantan. the team
received &amp;quot; Anugerah Emas&amp;quot;. Finally the team received &amp;quot; Anugerah
Emas dengan tiga bintang &amp;quot; at &amp;quot; Konvensyen QCC Peringkat Kebangsaan
anjuran NPC tahun 2000&amp;quot;
<p></p>
<p><center>
 </center></p>
<p><center>
 </center>
</p>
<p>&amp;nbsp;</p>
<p><center>
 </center></p>
<p></p>
<p>&amp;nbsp; </p>
<p> </p>
<p></p>
</body>
</html>
```

Figure 6.6: The Coding for electric.asp in the Departmental Module

6.3.5 Photo Module

Table 6.7 lists the files created for the Photo Module.

Photo.asp	DSCN0133.JPG
Image:	DSCN0131.JPG
105-0589_IMG.JPG	DSCN0271.JPG
105-0593_IMG.JPG	DSCN0129.JPG
105-0590_IMG.JPG	DSCN0276.JPG
105-0598_IMG.JPG	DSCN0112.JPG
toppag3.jpg	boiler.jpg

montly3.jpg	t116.JPG
pps.jpg	site(top).jpg
gasturb.jpg	turbine.jpg

Table 6.7: The List of Files Created for the Photo Module

Figure 6.7 depicts a sample coding for Photo Module.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
<head>
<title>Untitled Document</title>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
</head>
<body background="testing.gif">
<div align="center">
<script language="JavaScript1.2">

var variableslide=new Array()

//variableslide[x]=["path to image", "OPTIONAL link for image", "OPTIONAL text description (supports HTML tags)"]

variableslide[0]=['a.jpg', '', '']
variableslide[1]=['b.jpg', '', '']
variableslide[2]=['c.jpg', '', '']
variableslide[3]=['d.jpg', '', '']
variableslide[4]=['e.jpg', '', '']
variableslide[5]=['f.jpg', '', '']
variableslide[6]=['g.jpg', '', '']
variableslide[7]=['h.jpg', '', '']
variableslide[8]=['i.jpg', '', '']
variableslide[9]=['j.jpg', '', '']
variableslide[10]=['k.jpg', '', '']
variableslide[11]=['l.jpg', '', '']
variableslide[12]=['m.jpg', '', '']
variableslide[13]=['n.jpg', '', '']
```

```
variableslide[14]=['o.jpg', '', '']
variableslide[15]=['p.jpg', '', '']
variableslide[16]=['q.jpg', '', '']

//configure the below 3 variables to set the dimension/background color of the slideshow

var slidewidth=0 //set to width of LARGEST image in your slideshow
var slideheight=0 //set to height of LARGEST iamge in your slideshow, plus any text description
var slidebgcolor='#ddf1ff'

//configure the below variable to determine the delay between image rotations (in miliseconds)
var slidedelay=1000

////Do not edit pass this line////////////////

var ie=document.all&&navigator.userAgent.indexOf("Opera")==-1
var dom=document.getElementById&&navigator.userAgent.indexOf("Opera")==-1

for (i=0;i<variableslide.length;i++){
var cacheimage=new Image()
cacheimage.src=variableslide[i][0]
}

var currentslide=0

function rotateimages(){
contentcontainer='<center>'
if (variableslide[currentslide][1]!="")
contentcontainer+='<a href="'+variableslide[currentslide][1]+'">'
contentcontainer+='<img src="'+variableslide[currentslide][0]+'" border="0" vspace="3">'
if (variableslide[currentslide][1]!="")
contentcontainer+='</a>'
contentcontainer+='</center>'
if (variableslide[currentslide][2]!="")
```

```
contentcontainer+=variableslide[currentslide][2]

if (document.layers){
crossrotateobj.document.write(contentcontainer)
crossrotateobj.document.close()
}
else if (ie||dom)
crossrotateobj.innerHTML=contentcontainer
if (currentslide==variableslide.length-1) currentslide=0
else currentslide++
setTimeout("rotateimages()",slidedelay)
}

if (ie||dom)
document.write('<div id="slidedom" style="width:'+slidewidth+';height:'+slideheight+';
background-color:'+slidebgcolor+'"></div>')

function start_slider(){
crossrotateobj=dom? document.getElementById("slidedom") : ie? document.all.slidedom :
document.slidensmain.document.slidenssub
if (document.layers)
document.slidensmain.visibility="show"
rotateimages()
}

if (ie||dom)
start_slider()
else if (document.layers)
window.onload=start_slider

</script>

 <ilayer id="slidensmain" width=&{slidewidth}; height=&{slideheight};
bgColor=&{slidebgcolor}; visibility=hide>
<layer id="slidenssub" width=&{slidewidth}; left=0 top=0></layer></ilayer>
<br>
```

```
  <object classid="clsid:D27CDB6E-AE6D-11cf-96B8-444553540000"
codebase="http://download.macromedia.com/pub/shockwave/cabs/flash/swflash.cab#versio
n=5,0,0,0" width="162" height="30">
    <param name="BGCOLOR" value="#ddf1ff">
    <param name="movie" value="button33.swf">
    <param name="quality" value="high">
    <param name="base" value=".">
    <embed src="button33.swf" width="162" height="30" base="." quality="high"
pluginspage="http://www.macromedia.com/shockwave/download/index.cgi?P1_Prod_Versi
on=ShockwaveFlash"type="application/x-shockwave-flash" bgcolor="#ddf1ff" ></embed>
  </object>
</div>
</body>
</html>
```

Figure 6.7: The Coding for image2.asp in the Photo Module

6.4 Coding Style

Good coding practices are applied in the Company Information Portal system programming. This is mainly focusing on the system consistency, maintainability and readibility. The purpose of these techniques is to make the programming much clearer, more understable and more maintainable.

6.4.1 Commenting Codes

Comment is not part of the program code and it does not command any program executions. However, comments will slow down page execution because the script interpreter has to read and then skip the comment lines each time. In spite of such shortcoming, comments are still applied as part of common practice in documenting the system coding. This helps the programmer to understand what and why the coding was written. This also makes it easier for other people especially

collaborating programmers to understand the coding. Figure 6.8 shows the comments inserted in the part of the system coding.

```
var slidewidth=0 //set to width of LARGEST image in your slideshow
var slideheight=0 //set to height of LARGEST iamge in your slideshow, plus any text description
```

Figure 6.8: A Sample of Comments with Matching Codes

6.4.2 Include Script Files

The include Script files are used to insert its contents into any ASP page. This is useful when a section of hypertext markup language need to be inserted over and over again in the same page or other pages. Only the include instruction syntax need to be added to the pages that need the Include Script file. The include syntax is shown below:

```
<!-- #include file = "upload.asp" -->
```

This means that any updates to the Include Script file will automatically be reflected in every page that uses that specific file. This eases the tedious work of updating all the affected ASP page when changes need to be done.

Chapter 7

SYSTEM TESTING AND EVALUATION

7.1 System Testing

System testing is one of the key quality control and assurance measures performed in different levels throughout the system development. Testing is principal carried out to ensure that programs are executed and confined to the requirements specified. It is meant to detect heretofore-unknown problems and not to demonstrate the perfection of the system itself.

The objectives of the system testing are follows:

a) Testing is a process of executing a program with the intent of finding an error.

b) An effective test case is one that contains unexpected testing record sets with a high probability of finding and detecting an as-yet-undiscovered error during the program design and development phases.

c) A successful test is one that constantly provides new challenges to its programmers from time to time.

7.2 Stages of Testing

The testing process is implemented throughout the development of the Company Information Portal. It is implemented in stages as it is composed of modules. There are three distinct stages, namely Unit Testing, Integration Testing and System Testing. Figure 7.1 shows the flow of stages in testing.

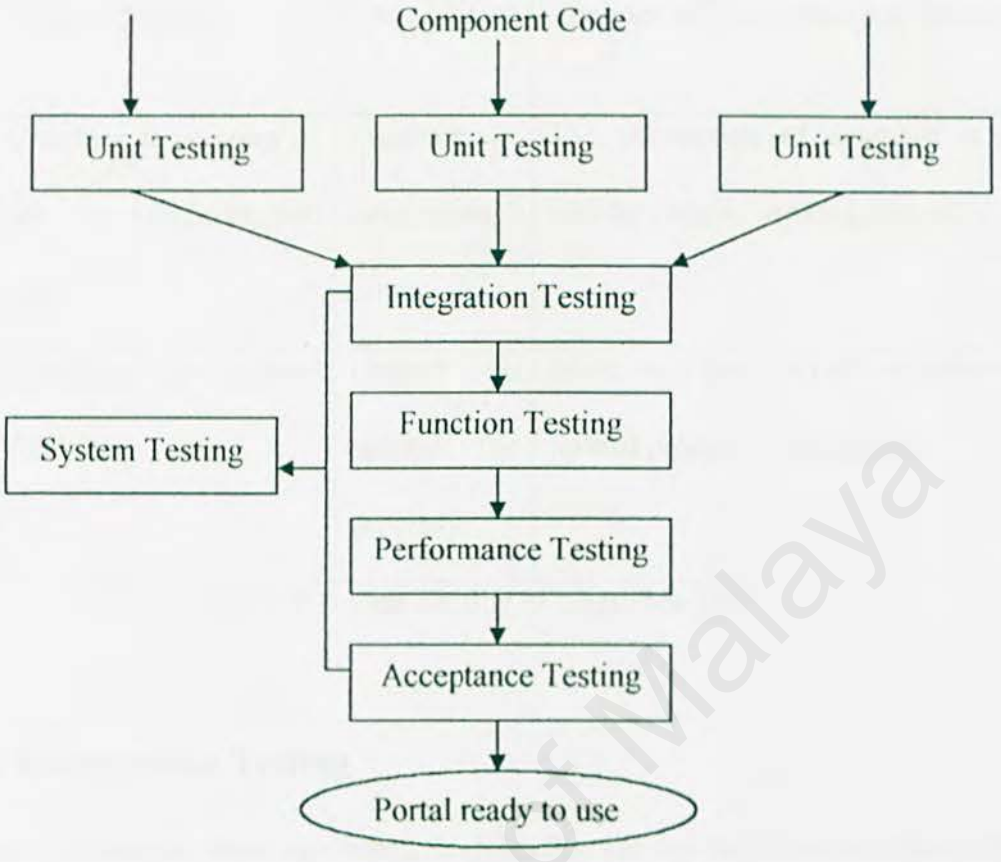

Figure 7.1: The Flow of Testing Stages

7.2.1 Unit Testing

Unit testing is the most micro scale testing where basic tests are performed at the component level to test particular functions or code modules. This is typically carried out by the programmer and not by testers, as it requires detailed knowledge of the internal program design and code.

The main objective of unit testing is to identify and eliminate both execution and logic errors. Execution error can cause the program to abnormally terminate while logic error is related to the accurateness and completeness of the processing. The main testing for unit testing is the login module.

No	Test Procedure	Output/Error	Analysis of Test Result and Solution
1	Checking the display of the Administration page.	Database connection error.	The connection of database is changed and the page is working properly.
2	Checking the upload function.	Unable to upload file properly.	Make sure that the path is correct and the upload process is successful.

Table 7.1: Unit Testing of Login Module

7.2.2 Intergration Testing

Integration testing is where combined modules that are dependent on one another are tested to determine if they function together as one. This is because integrated modules can be incorrect or inconsistent although the modules were individually proven satisfactory.

Integration testing ensures that valid linking and dynamic relationships are established between sub-modules and modules of the whole system. The testing is constructed and tested in small segments, where errors are easier to isolate and rectify. Each module in system will be tested again to ensure that all the modules are functioning properly without errors.

7.2.3 System Testing

System testing is a series of different tests whose primary purpose is to fully exercise the completed system. It is carried out on the entire integrated system as one unit to ensure that the entire system is validated. Its activity include testing of system performance, stress security, configuration sensitivity, usability, data integrity, error handling and recovery.

The purpose of the overall system testing is to ensure and verifies that the system is functioning properly with all design and development objectives are met.

(a) Functional Testing

System testing begins with the functional testing. This focuses on the system functionalities. Each function can be associated with some system components that accomplish it. The Company Information Portal employs several guidelines for functional testing, which is whether the information provides in the portal is suitable to the function that has been proposed.

(b) Performance Testing

The purpose of the performance testing is to address the non-functional requirement of the system. System performance is measured using performance objectives set by guidelines. As for the Company Information Portal system's performance, the portal would be able to perform the information needed by the TNBG's user such as history, mission & vision, location, organization structure, projects, department, statistical information and photo gallery.

(c) Acceptance Testing

After completing functional and performance testing, the portal has verified that all requirements specified are fulfilled in various stages of its development. Acceptance testing is finally carried out to determine whether the system is really usable or capable of meeting user's performance expectations and requirements.

7.3 System Evaluation

System evaluation is a process of evaluating the capability and usability of the developed system. The most important evaluation is the evaluation by the end users, as they are the ones who will be actually using the system in the end.

7.3.1 End Users Evaluation

The Company Information Portal's end user evaluation was conducted on 3rd January 2003 by the IT Engineer of TNBG in our faculty, FSKTM. He has been given his comments about the design of the interface for the Company Information Portal. Besides that, he also have give some good idea about how to improve the usage of Microsoft Sharepoint Portal Server to display the Company Portal into it. Overall, there is not much things to be changed in the Company Information Portal except some of the tiny mistakes.

Chapter 8

CONCLUSION AND FUTURE ENHANCEMENT

8.1 Problems Encountered and Its Solution

8.1.1 Problems in Selecting System Development Tools

There are a lot of good and potential development tools available for the use of developing the Company Information Portal. However, not all of these are suitable as each and every tool has its own strengths and weaknesses.

Some information finding methods and analyze the system requirement have been made to get the best combination of development tools. Electronic resources such as Internet has helped to finalize the development tools selection.

8.1.2 Problems in System Implementation

There are some system coding problem that consist of Cascaded Style Sheet, Javascript, Hypertext Markup Language and Active Server Pages programming. These programming problems are caused by the lack experiece of understanding the programming languages. Reference book, online resources and help from coursemate have helped to solve up this problems.

8.2 System Strength

8.2.1 User-Friendly Interface

An user-friendly interface with the main functions provided were designed. The interface enable the user to click on the button so that they can access to the information they need to know. The information such as history of the company, mission and vision, projects which has been going on and others could be gain by just simply click on it

8.2.2 Simple Login

A simple login which need the user to key in the user name and password so that they could be able to access the upload files function. This login system is only allowed the user with the administrator right to access into it.

8.3 System Constraint

8.3.1 Usage of Sharepoint Portal

The usage of Sharepoint Portal Server has limited the ability of designation for the Company Information Portal. The length of the company interface need to be putting into the Sharepoint as a subdashboard. Besides than the interface, the banner of the Company Information Portal need to follow the header set by Sharepoint.

8.4 Future Enhacement

8.4.1 Better Login System

A better login system using the Active Directory can be included in the company Information Portal's Login. This login system enables the user which login to the system would be able to be identify. This will easier the work of the user by minimised the number of logging in.

8.4.2 Upload Organization Structure using Template

Organization structure for a company will change from time to time. So organization structure which can be edited by the authorised user by selecting the photo of which position need to be changed can be done. This funtionality can be added in for the future enhancement using the method called templates.

8.5 Conclusion

The end result of the Company Information Portal is mainly for displaying the information of TNBG. This will enable the users of TNBG to access the information of the company. However, the functionality and practicality of the portal still needs improvement and perfection.

Overall, precious insights and a brief exploration of the real system development environment has been gained. This has provided valuable oppurtunities and unique exposures throughout the Company Information Portal development.

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